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COMPUTE!'s GAZETTE

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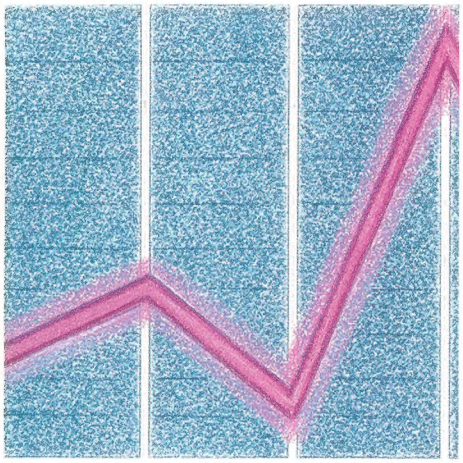

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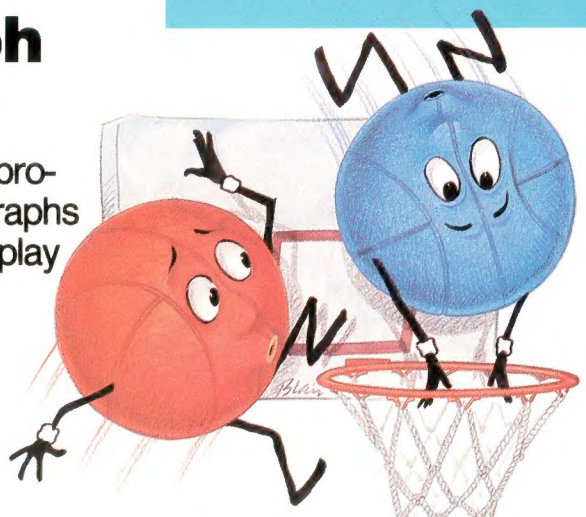

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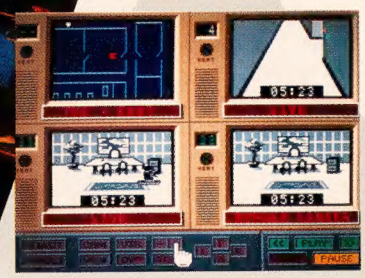

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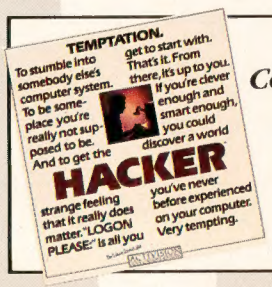
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editor's notes

It was unforgettable. Sigourney Weaver steps into a strangely distended fork lift tractor in the movie *Aliens* and begins to move boxes twice her height and many times her weight. Her arms and legs controlling the massive arms and legs of the machine, she performs superhuman feats of strength.

Her machine was a robot shell. It had everything except a brain and sense organs, and when she put it on, there was a potent synergy. The machine greatly amplified the human's strength and endurance, and the human gave the machine the eyes and brains it needed to be useful.

Such symbiosis is increasingly evident now in everyday life. With microprocessors currently selling in quantity for less than $1 apiece, it is cost effective to insert them into the joints and sensitive places of everyday consumer items.

Late-model cars, for example, contain more computer chips than grease fittings. Studded throughout the auto are microprocessors, little sensors, and RAM and ROM chips—all of them busy counting events, watching for weaknesses, adjusting fuel flow, and doing dozens of other tasks.

Cars equipped with ABS, the new Antilock Braking System, significantly increase safety on wet or iced roads. If the driver slams on the brakes and the car goes into a skid, the ABS system detects this and goes into action. It pumps the brakes at humanly impossible speeds. Nobody, not even Fred Astaire in a moment of extreme terror, could tap a brake pedal that fast. The ABS causes the car to maintain contact with the road surface and, thus, prevents skidding during difficult conditions.

Two things are interesting about this. First, the machine *knows* when to apply ABS. It is only invoked when the car itself senses the problem. Second, ABS amplifies the driver's physical abilities. Since this kind of braking is not humanly possible, it adds an entirely new skill to a driver's repertoire. In fact, it would be more accurate to call this a new skill added to the *car's* repertoire.

Elsewhere in the car, other silicon servants are quietly carrying out their duties as well. On the radio, a little red light flashes 24 hours a day, drawing attention to the lettering beneath it: ANTI-THEFT DEVICE. If the radio is removed from the car, the radio disables itself and cannot be used until a secret code is correctly entered into its station presets. Furthermore, to prevent brute-force efforts to find the code, you are given only three tries, and then you have to wait to try again. All this obviously discourages theft.

The radio is smart in other ways, too. It can scan to find the next station or the next song on a tape. It can play a few seconds of each station or song and then move on, giving you a chance to decide which selection you prefer. It automatically optimizes itself for strong or weak signals. It detects the kind of audio tape in use and switches itself to the correct bias for metal or chrome or normal formulations. And, after the tape player is played for 15 hours, a chime sounds and the message CLEAN flashes on the radio's LCD screen to remind you to insert a cleaning cassette.

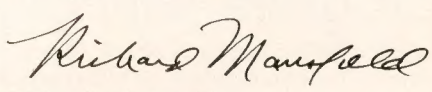
Cars are also now equipped with small computer consoles built right into the dash. They look like a calculator keypad, but the keys have multiple functions. If a thief decided to forget about the radio and just take the whole car, he would be unable to start the engine. The car's owner can program in an ignition code and thus prevent hot-wiring.

Other buttons provide various kinds of information or warnings. One tells you the outside temperature; another, the date or time. One shows the average miles per gallon, another, the average miles per hour. The computer can tell you how many miles left before you'll run out of gas, switch between ordinary and metric measurements, act as a stopwatch, or ring a warning chime when you exceed a particular speed.

You interact with this "official" computer, instructing it what to remember, what to watch out for, and what to display. But many other sensors and computer functions are not user-controlled. They simply lurk within, ready to offer warnings or other information from the LEDs and displays across the dashboard. The various parameters of the braking systems, the catalytic converter, window washing fluid, oil levels, the battery, coolants, and other items are continuously monitored for proper operation. It's as if your car were permanently under intensive care, ready to sound warnings at the first sign of trouble in any of its important systems. Some new autos even remind you when it's time to change the oil or go in for a general inspection. And, of course, when you take the car in for service, the first thing they're likely to do is attach probes from *their* computer to the engine.

Via computerization, machines are becoming ever more hospitable, sensitive to their owners' needs and preferences (favorite car-seat positions can be memorized, for example). But we are now also seeing the first examples of computerized systems which move machines beyond human capabilities. It's a new phenomenon: a mechanical combination of brains plus brawn.

If you ever go into a spin on an icy mountain road, you're likely to appreciate the cluster of computer chips that make your brakes smart.



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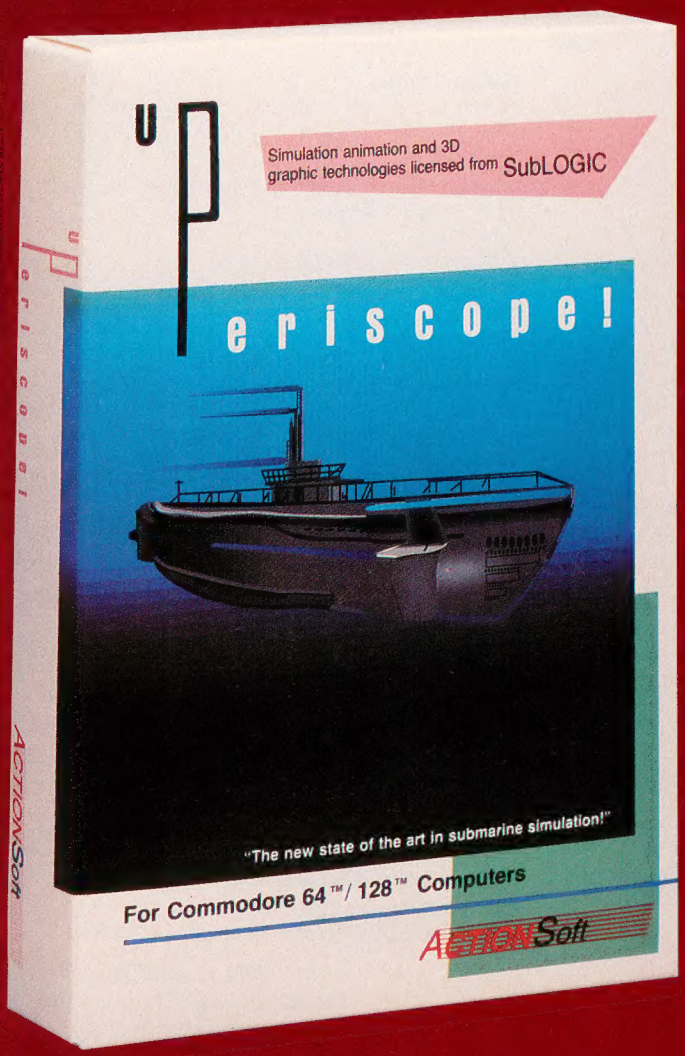
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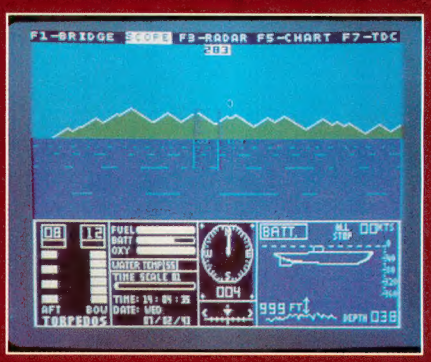

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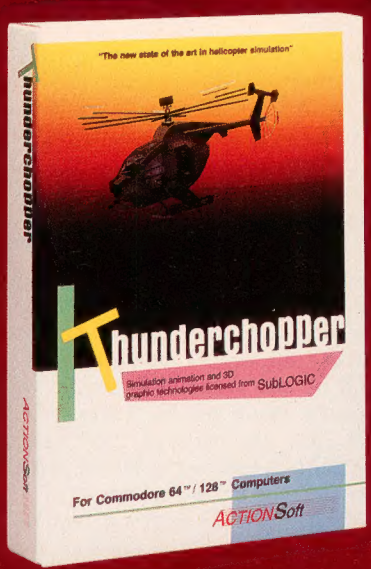
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Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.

A Running Total

I am taking a class in BASIC programming at the local junior college. One of our problems entails listing a column of numbers and showing the sum. My manuals do not mention a SUM or TOTAL function for the 128. I've included a program that I wrote. Is there another way to total a column of numbers? How would you change the program to accept variable input from the user?

Thomas Paul

There are a couple of ways you could get input from the user and calculate a sum. Here's one (for any Commodore computer):

```
10 FOR A = 1 TO 5
20 INPUT B
30 C = C + B
40 PRINT "SUBTOTAL: "; C
50 NEXT
60 PRINT: PRINT "TOTAL: "; C
```

This program keeps a running total of five numbers typed by the user. If you just want to add some numbers, the example above works well. But notice line 20, where a single variable, B, is changed each time the FOR-NEXT loop repeats. In some situations, you may want to remember the previously typed numbers. Here's another variation:

```
10 DIM N(5)
20 FOR A = 1 TO 5: REM INPUT LOOP
30 INPUT N(A)
40 NEXT
50 FOR A = 1 TO 5: REM SUM LOOP
60 T = T + N(A)
70 NEXT
80 FOR A = 1 TO 5: REM PRINT LIST
90 PRINT N(A)
100 NEXT
110 PRINT "TOTAL = ";T: REM PRINT
    TOTAL
```

The first FOR-NEXT loop stores the user's input in an array, elements N(1) through N(5). The second loop adds up the values from the array. The final loop prints the numbers and the total.

Parallel Universes

I give up. Where in the Commodore 128's memory is the 80-column screen located? I have looked all over with the machine language monitor. I can't find it, and the *System Guide* doesn't help.

Gregg Haverly

The reason you can't find 80-column screen memory is that it doesn't exist in the 128's system memory. Like parallel universes in a "Star Trek" episode, the 128K of system RAM and 16K of 80-column video RAM are separate domains with only a tiny portal between. The 8502 microprocessor that is the brains of the 128 has no direct access to 80-column memory. The processor can read from or write to locations in the 80-column video area only indirectly, via the VDC (Video Display Controller) chip that provides the 80-column output. See "Alt-80 For The 128" elsewhere in this issue for more information on passing values to the VDC.

The Two-Headed Disk Drive

I have a problem with my 128 and 1571 that I can't figure out. Every time I cut a second notch in a disk and format both sides in 128 mode, one of the sides does not work.

Jim Lewis

I have recently come across a problem with my 1571. After cutting a notch, I formatted the first side of a double-sided disk using the 128's HEADER command. The directory lists as it should. However, when I try to format the flip side, the first side is wiped out as if it had never been formatted. I don't have this problem with a 64 and 1541. Is my 1571 defective?

John Lommock

After you format a 1571 disk using the HEADER command, you may notice that there are 1328 blocks free, exactly double the 664 blocks free on a 1541 disk. The 1571 doesn't pack twice as many sectors onto one side of a disk—it uses both sides. The 1541 has one read/write head, but the 1571 has two—one for the top of the disk and one for the bottom.

The HEADER command formats both sides. If you flip over the disk and use HEADER a second time, both sides are formatted again, writing over the previously formatted sectors.

Call Ahead For Reservations

Almost everyone knows how garbage collection can slow down a program. But there is another situation that can lead to mysterious pauses. Such slowdowns are often the result of dimensioning large arrays at the beginning of your program. Any time a new simple variable is created after the arrays are in place, there will be a pause while the computer shifts all the arrays up in memory to make space for the new variable. The effect can be seen by entering and running the following short program:

```
10 T = 0: REM A=0:B=0:C=0:D=0:
   E=0
20 DIM A(7000)
30 INPUT "SIMPLE VARIABLE";A
40 T = TI:B=0:C=0:D=0:E=0
50 PRINT "SECONDS DELAY:";
   (TI-T)/60
60 INPUT "SIMPLE VARIABLE";A
70 T = TI:B=5:C=5:D=5:E=5
80 PRINT "SECONDS DELAY:"
   ;(TI-T)/60
```

John A. Spencer

For readers who are unfamiliar with garbage collection, here's a brief explanation. When string variables are assigned new values (with INPUT or GET, for example), the old string remains in memory. Eventually, as new strings are created and old ones are superseded, BASIC runs out of free memory. At this point, the garbage collection routine takes over and shuffles memory around to get rid of the unneeded garbage strings, a process that may take several minutes. Garbage collection is an occasional problem on the 64, but not on the 128.

In the example above, the delay is not due to garbage collection, but (like garbage collection) it's connected with the time it takes to move memory around.

There is a considerable delay while the variables in line 40 are initialized, but there is almost no delay while the same variables in line 70 are given new values. In the Commodore 64, programs are stored at the bottom of free memory. Just above the program are the simple (non-array) variables. On top of them are the arrays. Every number in a numeric array occupies five bytes, so the array in this program occupies slightly more than 35,000 bytes. Individual (simple) numeric variables need two bytes for the name and

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five for the value. The chunk of memory holding the large array must be moved seven bytes upward for every variable initialized in line 40. This makes a total of more than 140,000 bytes which must be moved (plus another 35,000 for the variable A used in the INPUT statement in line 30).

Line 70 executes very quickly because the simple variables have been defined and no moving needs to be done. If you delete the REM in line 10, the simple variables are initialized before the array is DIMensioned, and both line 40 and line 70 will execute rapidly. You can prevent delays by predefining the variables and reserving space before the array is set up.

While this program uses numeric variables and arrays to make the point, the same considerations apply to string and integer arrays. With string arrays, each array entry occupies only three bytes, so the time spent moving a string array of the same size would be slightly shorter.

Simple variables can also be initialized to zero using the DIM statement, with less use of memory and less typing:

```
10 DIM A,B,C,D,E,T
```

Plus/4 Software

Is there any way the Commodore Plus/4 could be transformed into a 64 internally (with a program or emulator, perhaps)? There are many Plus/4 users who would love to run 64 programs. Another question: Are there any user groups for Plus/4 owners?

Mark P. Pagala

Most commercial programs for the 64 make extensive use of its sprite capabilities and the SID chip, both of which are lacking on the Plus/4. It would be difficult, if not impossible, to emulate a 64 in software. A hardware emulator would probably cost at least as much as a 64, so it would be cheaper just to buy a 64 if you want to run 64 software.

The Plus/4 Users Group (PLUG) can be contacted at Box 1001, Monterey, CA 93942. They publish a newsletter that lists a variety of Plus/4 and 16 software. A recent issue noted that the Plus/4 and the 16 are fairly popular in Great Britain, and many programs can be ordered from overseas software companies. PLUG also provides public domain programs on tape and disk.

Modem As Tracer?

Every now and then I have problems with prank phone calls. I own a Commodore 1660 modem. Can I trace a call with the modem? If so, how? If not, why?

George Roedl

No, it is not possible to trace a call with a modem. Modems work by sending and receiving sounds over the telephone lines. These sounds are sent by one modem and interpreted by the other. Basically, all your 1660 can do is dial a phone, whistle into the outgoing line, and listen on the incoming line. It can't perform any special tricks like tracing a call. The best it could do is answer the phone and emit a piercing whistle. If you are concerned about the calls you receive, contact your local telephone company.

GEOS, ML, And Finding Books

What did I pay $40 more for? I was told that the 64C was advanced in graphics compared to the regular 64. What exactly is different?

Also, I bought a book on machine language. It says there are three commercial assemblers on the market, one of which is required. I have looked and looked but can find none of them. Could you give me the addresses (in Canada, if possible) and the prices for these assemblers? Also, where can I find the *Commodore 64 Programmer's Reference Guide*?

Mark Wadmen

Commodore has stopped manufacturing the 64 and is phasing it out. As the inventory is gradually sold off, the 64C will replace it on store shelves. A year from now, buyers won't be faced with the choice of which version of the 64 to purchase. There will only be the 64C.

The two computers are functionally identical; they have the same chips, the same operating system, the same BASIC, and so on. The new plastic case of the 64C is a cosmetic change only. What's different is that the 64C comes bundled with an advanced graphics-oriented operating system called GEOS *(for a thorough treatment of* GEOS*, see "A* GEOS *Update: One-Year Old And Growing Strong" elsewhere in this issue.) Purchased separately, the list price of* GEOS *is $59.95, so, in a sense, by paying $40 more for the 64C, you've saved $19.95 over the price of a 64 with* GEOS*.*

The book you mentioned is mistaken about there being only three assemblers. There are at least a dozen companies, including one in Canada, that make assemblers for the 64 and 128. (See the August 1986 Gazette for a complete list of names and addresses.) To obtain a particular book, such as the Commodore 64 Programmer's Reference Guide*, you can usually order it at a local bookstore.*

Randomly Jumping Around

I have been trying to get my 64 to randomly go to a line number between 1000 and 10000. How would you do this?

Daniel Malone

You can't use a variable or expression after GOTO to choose a particular target line. However, if you just want to randomly select one of several possible target lines, you can use ON-GOTO. The ON-GOTO statement will allow you to go to a specific line based on the current value of a variable. Here's a sample program fragment you could test:

```
900 L = INT(RND(1)*4+1)
910 ON L GOTO 1100, 1310, 5000, 5020
```

Line 900 puts in the variable L a random number from one to four. RND(1) always gives you a number between 0 and .99999999, which multiplied by 4 results in a range of 0 to 3.9999999. Adding one and rounding down (with the INT function) limits L *to whole numbers between one and four.*

In line 910, the ON-GOTO construction tests the value of L *and then jumps to one of the line numbers in the list. If* L *equals one, the program goes to 1100. If* L *equals two, ON-GOTO sends the program to 1310. GOTO may be followed by as many line numbers as you want, up to the 80-character line length limit of the 64.*

Joysticks And Sprites

Could you print a short program for the 128 that would use the JOY(N) command—have it move a sprite, for example? The manual isn't very clear.

Paul Levine

The 128's JOY function reads joystick in ports 1 or 2, depending on which value you put in parentheses. It returns a value of 0 (no movement) or of 1–8 (1 is north, 2 is northeast, 3 is east, and so on). If the fire button is held down, add 128 to the values.

Here's a short program for 128 mode that reads the joystick and changes the direction of a sprite. Press the fire button to exit.

```
10 SPRITE 1,1,4
20 MOVSPR 1,100,100
30 DO: J=JOY(1)
40 IF J=1 THEN MOVSPR1,0#1
50 IF J=3 THEN MOVSPR1,270#1
60 IF J=5 THEN MOVSPR1,180#1
70 IF J=7 THEN MOVSPR1,90#1
80 LOOP WHILE J<128
```

Hexed

Will you please write a program that makes hexadecimal into decimal numbers? Everything I've tried hasn't worked.

Jeff Trock

Most versions of BASIC support only decimal numbers. But sometimes it's easier to use hexadecimal numbers (base 16—often called just hex) on computers. Computers work in binary (base 2), and it's easy to convert numbers between their binary and hex representations (because 16 is a power of 2).

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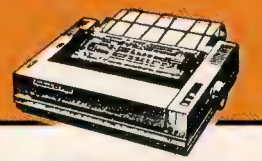

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The 128's BASIC 7.0 has two functions—HEX$ and DEC—that make conversion easy. If you're not using BASIC 7.0, here's a demo program that shows you how to convert from hex to decimal. It uses a one-line subroutine that you can use in your own programs. Set H$ to the hexadecimal number you want to convert; then GOSUB 90. When the subroutine returns, the decimal value will be found in the variable T.

```
QP 1Ø FORJ=1TO5:READH$:GOSUB9Ø
      :PRINTT:NEXT:END
RG 2Ø DATA FFFF,9,FE,4Ø,1
CB 9Ø T=Ø:FORK=1TOLEN(H$):A=AS
      C(MID$(H$,K))-48:A=A+(A>
      9)*7:T=T*16+A:NEXT:RETUR
      N
```

The Limits Of Precision

I've used my 64 for the past couple of years with excellent results. Recently I did have a problem, and a service man corrected it by replacing a chip.

Sometime later, I was using a spreadsheet and turned up the following: 6947.14 − 6748.06 = 199.07999 but 6947.14 − 6748.05 = 199.09. I tried several other combinations and found some answers that were five decimal places long, with each answer ending in 999.

Thinking the problem was in the program, I made the same calculations with the PRINT statement. The results were the same. The service man could shed no light on the matter. In fact, we tried several 64s and found the problem existed on all of them.

Is this just a characteristic of the 64? Can it be corrected?

L. Mundelius

Seeing 199.07999 when you expect an even dollars and cents amount like 199.08 can be surprising and disconcerting. It's not a problem peculiar to the 64; most computers will occasionally print fractional numbers with 9999 or 0001 tacked on.

The problem isn't a bug in the system, it's a mathematical feature you can't avoid. Leaving computers aside for a moment, consider the fraction 1/6, which converts to 17%, 16.67%, 16.6667%, or whatever amount of precision you choose. (The perfect percentage would have an infinite number of sixes after the decimal point.) If you add the percentages 17 plus 17, the answer is 34. Likewise, 16.67 plus 16.67 is 33.34. The rounding errors accumulate (2/6 should really be 33% or 33.33%).

Translating from a fraction to a percentage or a base ten decimal representation can introduce small rounding errors. The same thing happens when you ask a computer to convert a number to a binary floating-point value. As you add or subtract, the rounding errors accumulate.

One way you can bypass the rounding problem is to use only integers—counting pennies instead of dollars. The calculation (694714−674806)/100 will give you the correct answer because you're subtracting whole numbers and dividing by 100 only after the calculations are finished.

Lost And Found

My Commodore 128 seems to be missing a chip. I've looked at the circuit board and noticed that the socket labeled U36 is empty. Could you please tell me what chip this is and how I can get one?

Brian Brown

There's nothing missing from your 128. You've simply discovered a feature of the 128 that has yet to be exploited. If you've read about the 128's memory management system, you may have noticed that two different types of additional ROM are supported—internal function ROM and external function ROM. External function ROM, visible in bank configurations 8–13, is connected through the memory expansion port. It's ROM on the cartridges you're probably familiar with.

The socket you noticed inside the 128 was provided for the installation of a chip for internal function ROM. When installed, this ROM is visible in bank configurations 4–7. This ROM could be used to supply built-in applications programs like those in the Commodore Plus/4. However, we haven't yet heard of any commercially-produced programs supplied in ROM chips for internal use. (Because internal function ROM appears in different banks than external function ROM, you can't just remove a ROM chip from a cartridge and plug it into the internal socket.) Your computer is not anomalous; socket U36 will be empty on practically any 128 you peer into.

Extended Background Color Mode

I have heard the term *extended background color mode*, but I am confused as to what it means. I do know that memory locations 53282 to 53284 have something to do with it.

Matthew Mooneyham

On a normal text screen, there are three areas of memory that control the characters and the colors on your TV or monitor. Screen memory is 1000 bytes containing screen codes (of which there are 256). Color memory is 1000 bytes, each holding one of the 16 color codes. And the VIC chip register at 53281 controls the background color. You can POKE to screen memory and color memory to display a rainbow of characters. But there's only one background color. If you POKE a new number into 53281, the background color of the whole screen changes.

In extended background color mode, each character still has a foreground color and a background color. But instead of one universal background color, you can choose from four. (Color memory is still active, so you can choose any of 16 colors for the character color.) The four background registers are located at 53281–53284. Note that extended background color mode is not the same thing as multicolor mode.

There's a price you pay for the extra colors, however. Instead of 256 different characters, you have only 64 (screen codes 0–63). If you POKE a character from 64–127 to the screen, you get background color two. Characters 128–191 have background color three. And 192–255 have the fourth background color. The letter E *is screen code 5. To see it with each of the four background colors, POKE the numbers 5, 69, 133, and 197 to screen memory.*

To get into extended background color mode, ***POKE 53265,PEEK(53265)OR 64****. To return to normal,* ***POKE 53265, PEEK(53265)AND 191****. When you go into this mode, POKE various colors into the registers at 53281–53284.*

Plus/4 Memory

I own a Plus/4 and am interested in using the RAM under ROM above address $8000 for my machine language programs. Can you tell me how to access this memory?

Daniel Cardille

On the Plus/4, memory above 32768 ($8000) can be either ROM or RAM. In its default state, the computer addresses ROM in this area. If you examine this memory by PEEKing from BASIC or by using the D *or* M *commands of the built-in machine language monitor, you'll see ROM. However, anytime you POKE into this memory, the values POKEd get stored in the underlying RAM.*

To reconfigure the computer to see the RAM, from a machine language program: Disable interrupts with a SEI; store a value to location $FF3F (any value is will do); then reenable interrupts with a CLI. To switch ROM back in, follow the same procedure used to switch RAM in, but store to $FF3E rather than $FF3F.

Program Punctuation

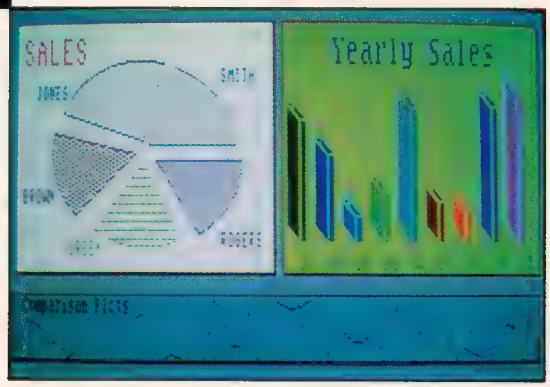
My question involves the use of the semicolon and the colon. I have seen several programs using them in two ways I don't understand. The first is as a start to the line—**10 : POKE 53281, 0**—where the colon comes after the line number. The second is the two together, with the semicolon first. For example, **20 PRINT A;: POKE 255,1**. I thought the semicolon's purpose was to tie statements together and the colon's was to end statements.

Randall D. Koller

Some programmers like to indent the lines

Introducing BASIC 8

By Lou Wallace & David Darus



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between a FOR and a NEXT, but Commodore BASIC removes all blank spaces between a line number and the first command on the line. Try typing a line number, ten spaces, and then a BASIC keyword. If you list the line, you'll notice the spaces are gone. But if you put a colon at the beginning of the line, the line is indented. So the answer to your first question is: The colon doesn't do anything except make the line look nice.

In the second example, both the semicolon and the colon serve a purpose. The colon separates individual statements on the same line. You can place a POKE, a NEXT, and an IF-THEN on the same line as long as you put colons between them.

A semicolon has nothing to do with separating or tying together BASIC statements. It's always used in conjunction with the PRINT statement. A line such as ***PRINT "HELLO"*** *causes the word HELLO to appear on the screen. The cursor then moves to the beginning of the next line. PRINT automatically adds a carriage return. There are some cases where you don't want the cursor to drop through to the next line. So a semicolon after the PRINT statement tells the 64 not to print a carriage return, to leave the cursor alone after the string or variable is displayed. Commas are similar, but they cause the cursor to jump to the next available column (on the 64, there are four columns of ten characters).*

In the example ***PRINT A;: POKE 255,1****, the semicolon is part of the PRINT statement. It leaves the cursor on the same line. The colon separates the two BASIC commands on the line.*

PIP Problems

I have been having problems with the CP/M system, especially the PIP command. I bought a copy of your March issue because of the article about PIP. Following the instructions, I use the FORMAT command to format a disk. At the A> prompt, I place the CP/M disk in my drive and type PIP. When the asterisk appears, I type E:=A:CPM+.SYS and press RETURN, which causes the disk drive to start. When the asterisk appears again, I type the next line, at which point the screen reads R/O ERROR. Every time I try this, it happens at this point. Can you tell me what I'm doing wrong?

Gary J. King

With a single-drive system, you must use the virtual drive E to copy files from one disk to another. Drive A is the main disk drive (the one you're copying from); drive E uses the computer's memory to store the file temporarily (it's the disk you're copying to).

*When you type E:=A:CPM+.SYS in response to PIP's * prompt, it tells PIP to copy the file named CPM+.SYS from drive A to drive E. The disk drive spins a while, during which time the file is being read from the source disk into memory. When the drive stops, the screen should say "Insert Disk E," which is your prompt to remove the first disk and put the destination disk in the drive. When it's ready, press RETURN to tell PIP to continue. Depending on the length and number of files you're copying, you may see several prompts to insert disk A or disk E.*

The R/O ERROR message means the disk in the drive is Read Only. The write-protect notch is covered up, and you can read from but not write to that disk. We suspect that you're not switching disks and that PIP is trying to copy the file to the CP/M system disk, which is write-protected.

The Winning Number?

I wrote a short program based on the lottery system. It is supposed to generate six numbers in the range 1–40, with no duplication. Is there a more efficient way to do this than checking each number against its predecessors? A friend suggested that there might be a way of creating an array of 1–40 and randomly plucking six numbers from the array, but he wasn't sure exactly how to do this. Finally, what's the fastest way to display these numbers in order?

Jack M. Hirsch

It can be done the way your friend suggested. In the example program below, an array called LOT is initialized to zeros. Then six random numbers are generated. Each random number is checked against the LOT array of previously chosen numbers. If it has been chosen already, another number is picked. If it hasn't, the corresponding LOT variable is set to 1—a flag indicating that it has been picked.

When the program is written this way, there's no need to sort the numbers—just step through each element of LOT, printing the index if the number was picked.

Here's the program:

```
KK 10 N=40
SS 20 DIM LOT(N):X=RND(-TI)
BF 30 REM INIT THE ARRAY
MR 40 FOR I=0 TO N:LOT(I)=0:NE
      XT I
DR 50 REM ELIMINATE ZERO
SC 60 LOT(0)=-1
RJ 70 REM CHOOSE SIX NUMBERS
MQ 80 FOR J=1 TO 6
QS 90 X=INT(RND(1)*N+.5)
KR 100 REM IF SELECTED CHOOSE
       {SPACE}ANOTHER
JH 110 IF LOT(X)<>0 THEN90
RP 120 REM X IS PICKED
BQ 130 LOT(X)=1:NEXT J
HX 140 REM OUTPUT IN ORDER
BP 150 PRINT"{CLR}{DOWN}SIX NU
       MBERS ARE ";
SF 160 FOR I=0 TO N
ES 170 IF LOT(I)=1 THEN PRINT
       {SPACE}I;
BB 180 NEXT I
```


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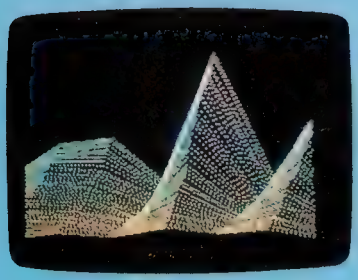

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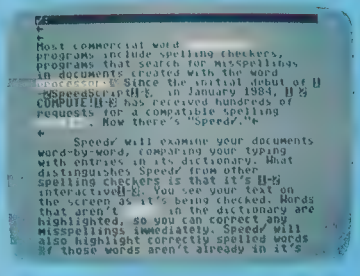

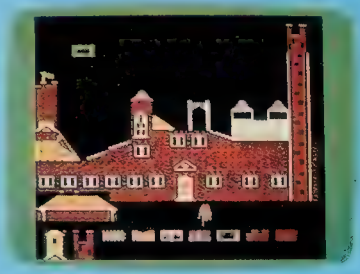

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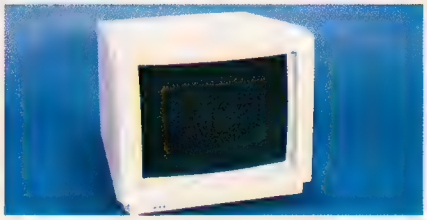

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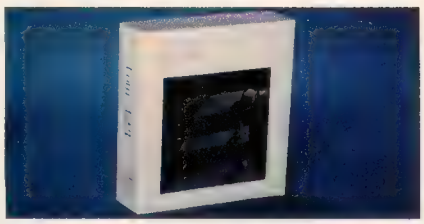

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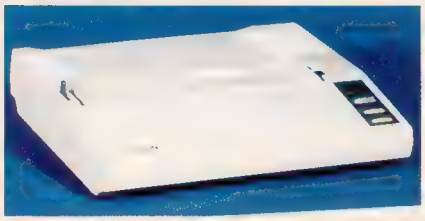

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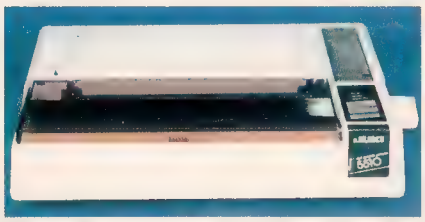

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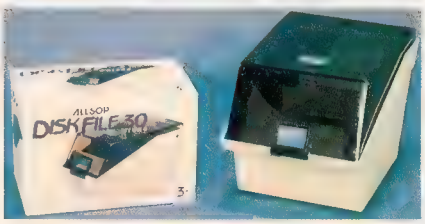

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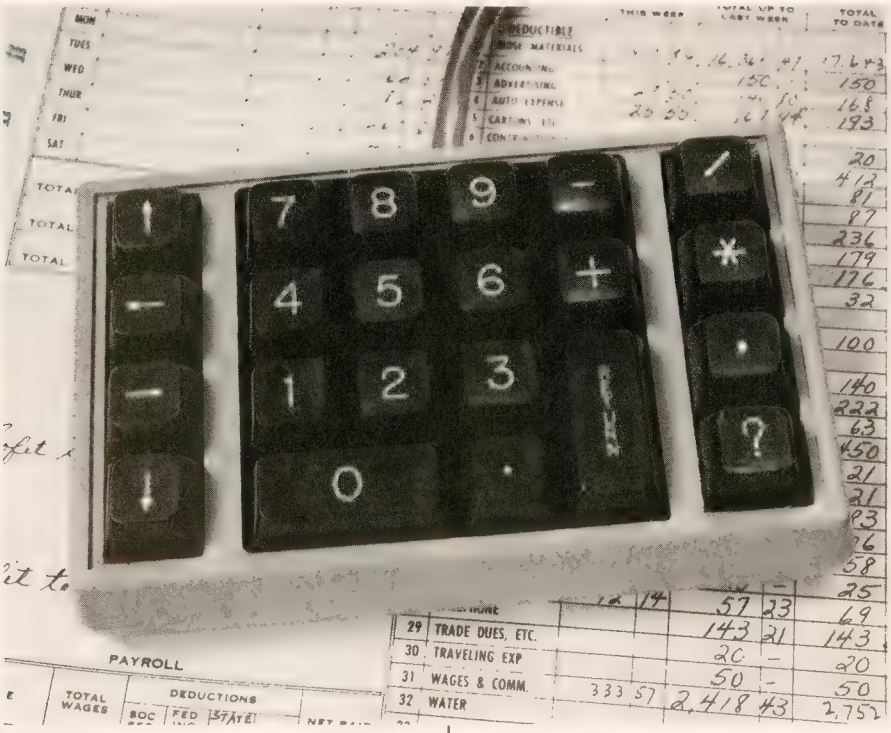

The NKP Deluxe numeric keypad from Computer Place.

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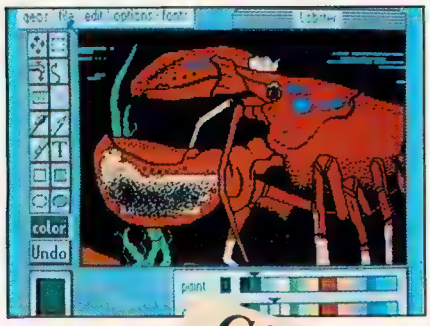

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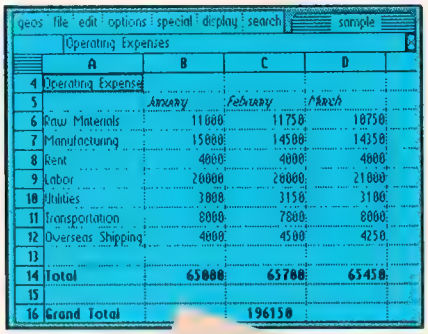
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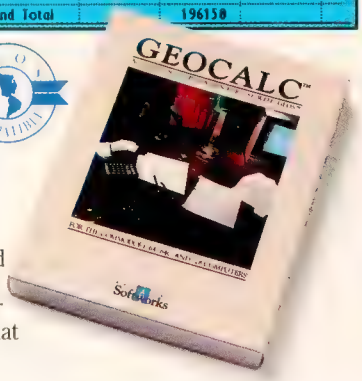

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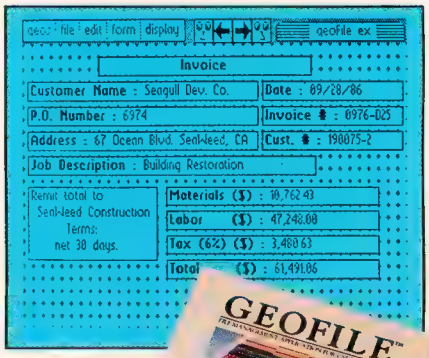

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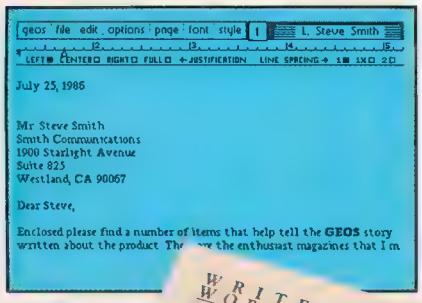
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Berkeley Softworks

The brightest minds are working at Berkeley.

GEOS Update:

One Year Old And Growing Fast

Lee Noel, Jr., Assistant Editor, Art & Design

In March 1986, the introduction of GEOS *promised a whole new world for the 64. In just over a year, this powerful software—now dubbed by Commodore as the "official operating system for the 64"—has become a complex and fascinating network of products. Here's a look at* GEOS *today—and tomorrow.*

By now, nearly all Commodore 64 and 128 owners are aware of *GEOS* (*Graphics Environment Operating System*), a revolutionary operating system from Berkeley Softworks that includes the icons, windows, pull-down menus, and other user-friendly features found in the graphics-based interfaces employed on the Apple Macintosh and other more advanced computers.

Berkeley's breakthrough product began reaching mail-order buyers in March 1986. Since then, the system has been available through two main channels. Computer dealers and mail-order firms offer *GEOS* to users who already have 64s, and Commodore packages *GEOS* with every new 64C. Not surprisingly, this double-barreled approach has been successful at moving the system rapidly into the hands of many 64 users. At the time of this writing, Brian Dougherty, president of Berkeley, estimated direct sales (from Berkeley) at 130,000, coupled with an additional 320,000 bundled with Commodore 64Cs. Clearly, a large base of *GEOS* users is developing rather quickly.

Two factors point to continued strong growth for the system. First, sales figures are running at a robust level. According to Dougherty, February was Berkeley's second best month for sales—ever. Second, sales of the various follow-up products for the system are exceptionally strong. Dougherty believes that 64 users who grow accustomed to the new environment feel a great reluctance to leave it.

On the other hand, the relatively small number of complaints that *GEOS* has generated usually concern printer drivers, the small programs that allow *GEOS* output to be tailored to different brands of printers, and compatibilty problems with some interface cards, hardware add-ons that perform much the same function as the drivers.

Upgrades And Support

Berkeley's answer to any problems with *GEOS* is to constantly refine and upgrade all drivers and other programs as needed. There are now about 40 drivers available, and they are capable of operating about 70 different printers.

Berkeley is committed to supporting its customers through a widespread network of services. Postpurchase, mail-in buyer registration cards are the first segment of the support structure. In the case of *GEOS*—a sophisticated operating system, not a game or single application program—this step is of critical importance since it allows Berkeley to communicate with users who have entered the *GEOS* world. Since this world is growing and changing rapidly, constant and continual communication is a necessity. For example, in addition to printer drivers, many of the basic programs of the core *GEOS* system have been updated since the original 1.0 release. Most of these have now been improved to the 1.3 level, and the registration cards enable Berkeley to advise purchasers of the various upgrade options.

In addition to service by mail, a telephone hotline is also available. Unfortunately, as Dougherty notes, the phone lines for this service are sometimes overwhelmed by the sheer number of calls; and the success enjoyed by *GEOS* has made it impossible for Berkeley to expand enough to meet the demand. Still, many users are able to get through. Not only are their questions answered, but careful note is taken of their comments. As the months have passed, much of the resulting information has translated from phone suggestions into improvements in both programs and documentation.

The final aspect of Berkeley's support capabilities is the company's strong presence on Quantum-

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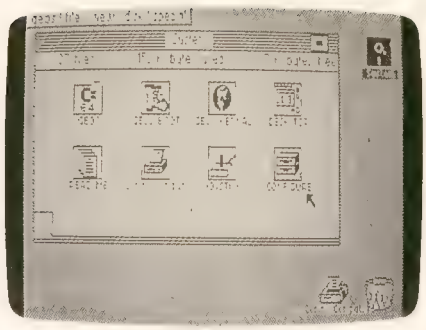
Link, the Commodore-specific telecommunications network. Here, Berkeley maintains a software download library from which the latest *GEOS* upgrades are available, as are smaller patch programs that fix bugs or other deficiencies. The online *GEOS* forum is also a rich source of information. Difficulties with the system can often be resolved by interchanges between users—without any direct involvement with Berkeley. However, Berkeley maintains on QuantumLink a technical bulletin board manned by a different major software engineer every day. In addition to the resident experts, Dougherty is impressed by the technical knowledge of some of the outside contributors to the board. He says that a few of them appear to have built up a fund of system information that comes close to rivaling Berkeley's own.

GEOS Today

Berkeley continues to expand the horizons of the *GEOS* world. Five separate packages are already available to extend *GEOS*'s usefulness: *Deskpack 1*, *Fontpack 1*, *Writer's Workshop*, *geoDex*, and geoPrint Cable. Let's take a look at what these are, and how they work. At the same time, we'll reprise the basic *GEOS* system, but in its upgraded 1.3 version.

The heart of *GEOS* now consists of two double-sided disks containing the core programs that make up the basic system. These programs are presently all at a level where they're designated as 1.3 versions. At this point, the software seems to be substantially bug-free, so users with the earlier versions, 1.0 and 1.2, should be sure to upgrade to the new standard. Current purchasers of the main system will find that it's packaged in such a way that even an inexperienced user can get *GEOS* up and running in a short time. And the new two-disk arrangement makes considerably easier the job of installing the system and protecting it with a backup disk.

At the center of the core programs, the *GEOS* Kernal and *deskTop* perform a magic transformation on the 64, converting the entire operating system into one based on readily comprehensible graphics.



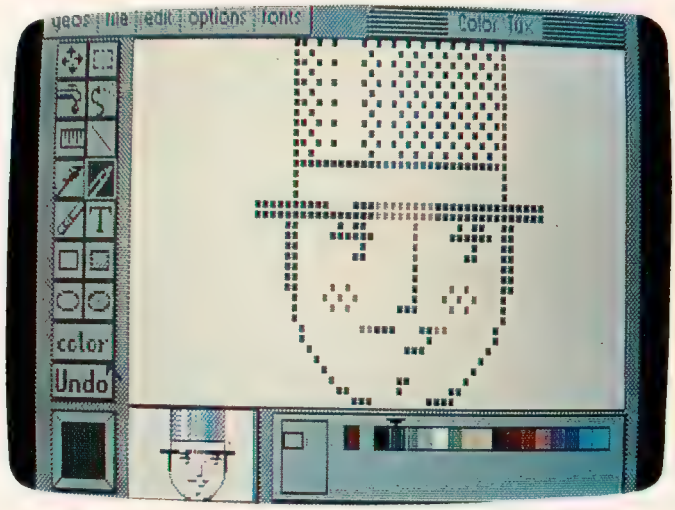
The GEOS deskTop *establishes a friendly graphic environment for the entire system.*

At the same time, they accelerate the 1541 disk drive from a lumbering clunker into a speedy machine fully capable of playing a pivotal part in *GEOS*'s disk-intensive operations. (For those who may have doubts, here are some pertinent figures using *SpeedScript*, COMPUTE!'s popular word processing program, as a yardstick. With the 64 and 1541, loading *SpeedScript* takes about 25 seconds. Saving requires approximately the same time. With *GEOS*, loading is accomplished in 4 seconds, and saving takes about 6. The 1.3 *deskTop* incorporates a number of helpful new features. These include automatic protection against deletion for certain master files, and keyboard alternatives allowing any input device (joystick, mouse, light pen, and graphics tablet) to be installed in midsession. Previously, this change involved moving input drivers around on the *deskTop* and rebooting the system.

Applications Power

The major applications in the base system are *geoPaint*, a full-featured graphics editor and drawing program, and *geoWrite*, a word processor that offers, among other features, 80-column text and a variety of attractive fonts. These programs can work together, trading text and graphics back and forth, and both are oriented towards producing a final printed document of high quality. The 1.3 upgrades of the programs appear virtually identical to their forebears, but operate more smoothly and quickly. In intensive tests over a three-week period, they performed flawlessly.

geoPaint 1.3 offers full color control, but keep in mind that the system display is created in the 64's highest resolution. Hence, although the computer's operating system has been supplanted by *GEOS*, use of color is governed by the hardware limitations of the VIC-II chip that generates all the 64's graphics. Probably the best way to create full-color graphics with *GEOS* is to use the program's color option to turn off color while you create your artwork. In this mode, pixels are either on or off,



One element of geoPaint's *impressive array of artistic options is the pixel-edit mode being used in this picture.*

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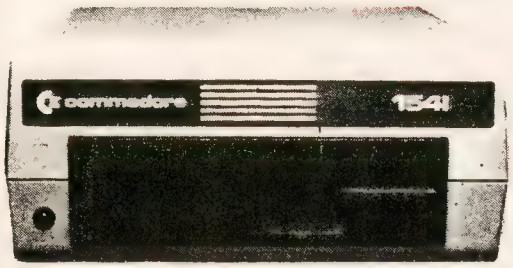

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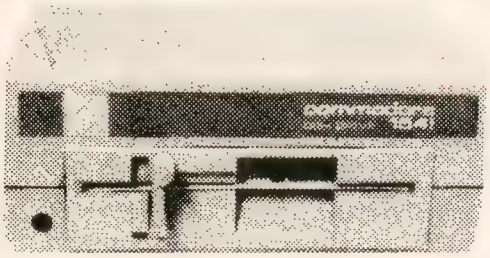

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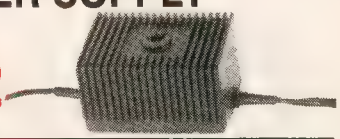

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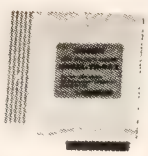

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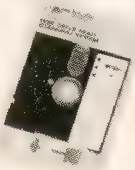

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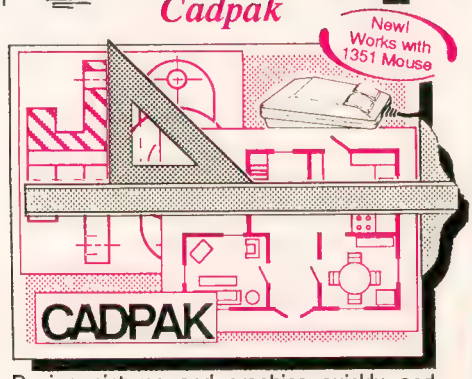

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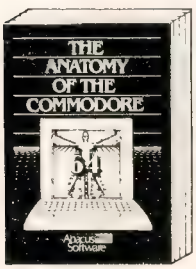

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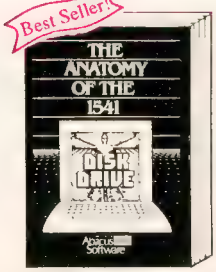

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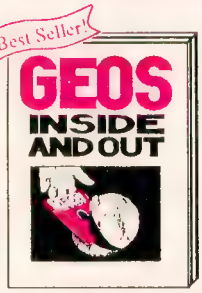

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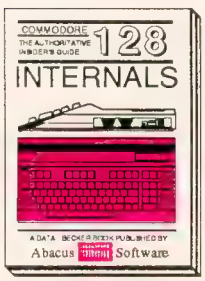

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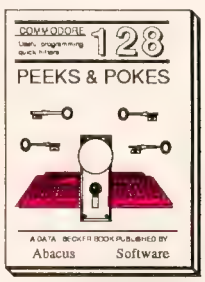

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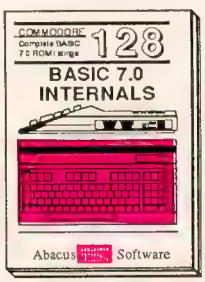

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and *geoPaint* offers a wide and effective range of methods for completing the base artwork. Once the basic design is complete and has been saved to disk, *geoPaint* allows both foreground and background colors to be added quickly to the artwork. Although there's been some criticism of this scheme, it's highly effective and is actually one of the few workable methods of controlling color in true high resolution. Incidentally, if you use the copy box with color turned *on*, the box automatically restricts itself to copying only groups of complete 8 × 8–pixel color cells. Using this method, there's no danger of color interference between the cells that are moved and those already in place. As Berkeley suggests, the way to get around this limitation is—once again—to turn color *off*. The copy box then works in any screen position, and color can be applied at a later point.

geoPaint also has a close-up graphics editor that makes detail work with individual pixels easy to do. Quite frankly, this option is a joy to work with. However, one way to improve its usefulness is to select the line drawing tool rather than the pencil option that's automatically presented in this mode. Just as it does on the full screen, the line tool allows the user to start a line, move it elastically through any number of possible positions, and then fix it with a push of the joystick or mouse button. Using this simple technique, it's possible to check the appearance of each segment of your close-up work before actually having to commit it to the screen.

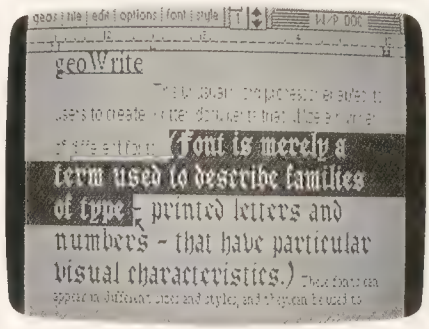
It's important to note that even the latest version of *geoPaint* has a few areas that need careful attention. Returning to the tool-selection menu when, say, the copy feature is active can result in confusion, especially if *undo* is the next option selected. Be sure the edit box, which demarks the area to be copied, is in a stable situation before attempting to select another tool. Otherwise, you'll sometimes be left with an unwanted box margin onscreen. This problem affects a number of other tools, notably the text-insertion box. If you're aware of it in advance, you may be able to avoid any unwanted effects. Also unfortunate is a tendency of this application to sometimes start producing garbage—random screen details—after periods of heavy use. If this happens, it's possible to minimize the effect by exiting *geoPaint*, returning to the *GEOS deskTop*, and reloading both *geoPaint* and the automatically saved version of the design you were working on. The reloaded *geoPaint* will usually function normally and can be used to tidy up the screen garbage. Failure to take immediate action in this way can result in considerable damage to the design in memory, and *geoPaint* may eventually become inoperable in the current session. Although these problems may sound serious, they don't have to be. With *GEOS*'s quick disk access and the convenient update menu option, it's only a second's effort to preserve on disk each successful stage in the progress of your design work. A little care is all that's needed to use *geoPaint* with full safety.

Word Processing

When it's time to work with words rather than graphics, *geoWrite* offers a wide range of possibilities. This word processor enables the writer to display text in a variety of different styles and typefaces. (To achieve this flexibility, the system actually draws each letter as it is put onscreen.) The kinds of type supplied with the system range from the ornate, old-English Dwinelle to the tiny, utilitarian BSW. These differing typefaces, or *fonts*, give the writer the option of visually enhancing a document, tailoring its appearance to fit its content. A different font may be used at any point in the document, and existing text may be easily transformed from one font to another.

When printed, the finished document retains all the character of the screen image. This ability—to produce attractive printed text documents—is, in essence, achieved by printing a hi-res graphics screen dump of the monitor display. This means that each dot in each letter is separately and individually examined and then translated into hardcopy. Many 64 users are aware of how long this process can take when a graphics screen is printed. From a number of letters we've received, it's clear that some *GEOS* users did not realize that exactly the same process is used to print *geoWrite* documents. It's a case of a simple tradeoff: In exchange for fancy text, printing speed is sacrificed.

Speed can also become a factor in typing if a complex font is being used with *geoWrite*. It takes longer—not surprisingly—to form on the screen a large flowery letter than it does to make a small, straightforward one. However, Berkeley's suggestions on the subject are clear and workable: Use small, simple type to enter text, and restrict the document to one screen width using *geoWrite*'s margin feature. In this configuration, the system's response to keypresses is more than adequate.



The geoWrite *format somewhat resembles a typewriter, but this highlighted text can now be magically transformed.*

Once a document has been completed using this suggested method, the text can be reformatted to the full page width, and any desired font features may also be added at this time. Reformatting takes only a moment, and may be repeated until the finished product is fully satisfactory.

geoWrite 1.3 has one especially useful enhancement, which is alternative keyboard selection of most menu options. By simply pressing the Commodore key in combination with another specified key, it's possible to cut and paste, flip quickly through the pages of a document, set page breaks, and specify different styles of text (bold, italic, underline, and so on).

In general, of course, this program retains the flavor of a typical mouse- or joystick-driven, graphics-oriented word processor. Text prints with exactly the same appearance as it has in the screen display. Any piece of text, from a letter to an entire page, can be selected by

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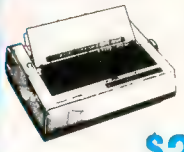

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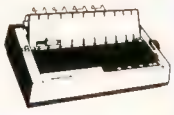

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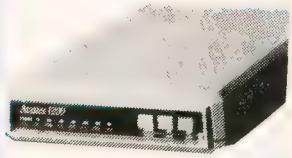

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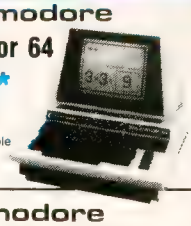

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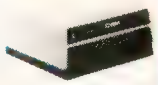

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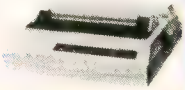

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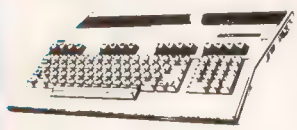

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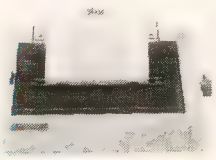

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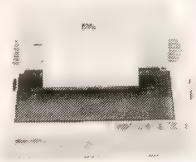

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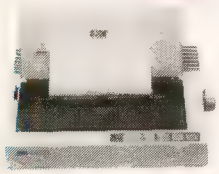

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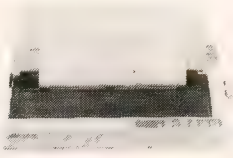

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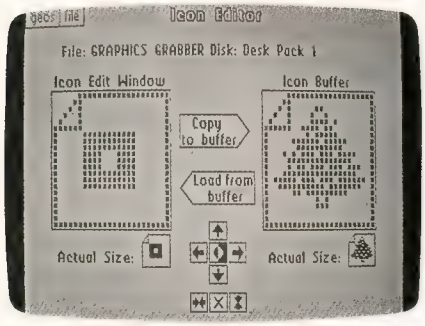
just moving the cursor around and pressing a button. Once selected, the text can be speedily edited or reformatted as the writer wishes. For most word processing purposes, this type of program represents an excellent blend of ease-of-use and sheer writing power.

New Products

One of Berkeley's first releases after the main *GEOS* system was *Fontpack 1*. This package consists of 20 distinct and expressive new fonts, all of which can be used in either *geoPaint* or *geoWrite*. The variety of typefaces available in *Fontpack 1* suits applications from sober and solid to awkward and angular—and most things in between. The fonts in the basic *GEOS* package are so widely applicable that acquiring the new ones might seem something of a luxury. Actually, for anyone using *GEOS* for serious desktop publishing, the design possibilities opened up by the new typefaces are probably too significant to ignore. Using these fonts requires no more effort than just moving icons around on the *GEOS deskTop*, and possibly a couple of disk swaps. *Fontpack 1*, like most new *GEOS* packages, includes basic system upgrade programs.



The Deskpack *icon editor enables users to rapidly customize file icons.*

Another early follow-up product was *Deskpack 1*, a collection of four new applications. These programs are something of a grab bag, so don't look too hard for a thematic connection between them. For the fun-loving, there's a blackjack game that uses a properly constituted, 52-card deck. Wizard players will be able to card count to their heart's content. The program also supports doubling, splitting, and insurance against the dealer.

This is Boalt 24 pt.

1234567890-qwertyuiop*asdfghjkl:;=zxcvbnm,./!"0-QWERTYUIOP*ASDFGHJKL=ZXCVBNM?

This is Tilden 24 pt.

1234567890-qwertyuiop*asdfghjkl:;=zxcvbnm,./!"0-QWERTYUIOP*ASDFGHJKL=ZXCVBNM?

This is Mykonos 24 pt. plain.

1234567890-qwertyuiop*asdfghjkl:;=zxcvbnm,./!"0-QWERTYUIOP*ASDFGHJKL=ZXCVBNM?

This is FontKnox 24 pt.

1234567890qwertyuiop*asdfghjkl:;=zxcvbnm,./!"0QWERTYUIOP*ASDFGHJKL=ZXCVBNM?

This is Durant 24 pt.

1234567890+-qwertyuiop@*^asdfghjkl:;=zxcvbnm,./!"#$%&'()0+-QWERTYUIOP@*^ASDFGHJKL[]=ZXCVBNM<>?

This is Superb 24 pt.

1234567890+-qwertyuiop@*^asdfghjkl:;=zxcvbnm,./!"#$%&'()0+-QWERTYUIOP@*^ASDFGHJKL[]=ZXCVBNM<>?

This is Stadium 24 pt.

1234567890-*:;,.!0-QWERTYUIOP*ASDFGHJKLZXCVBNM?

Fontpack 1 *offers a wide and expressive range of typefaces to augment those included with the basic* GEOS *system.*

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Enhanced Boldface
Condensed Text Double-strike
example of Near Letter Quality

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Print Buffer
8K bytes utility buffer
Printing Direction
Text Mode — Bi-directional
Graphic Mode — Uni-directional
Interface
Centronics Parallel Port
Paper
Plain paper, Roll paper, Single sheet
Fanfold, Multipart paper: max. 3 sheets (original plus 2 copies)
Character Fonts
Pica, Elite, Italics, Condensed

Printing Method
Impact dot matrix
Printing Speed
160-180 CPS at standard character printing
Printing Characters
Standard 9 x 9 dot matrix
NLQ 12 x 18 dot matrix (33cps)
Character size: 2.12 x 2.8 mm (standard)
Character sets: Full ASCII character set (96)
32 International characters

Ink Ribbon Cartridge
Ribbon Life: 3 million characters/cartridge
Physical Dimensions
Size: 15" x 12" x 5"
Weight: 12.7 lbs.
Maximum Number of Characters

Standard:	10 cpi	80 cpl
Standard enlarged:	5 cpi	40 cpl
Elite:	12 cpi	96 cpl
Elite enlarged:	6 cpi	48 cpl
Condensed:	17 cpi	132 cpl
Condensed enlarged:	8.5 cpi	66 cpl
Condensed elite:	20 cpi	160 cpl

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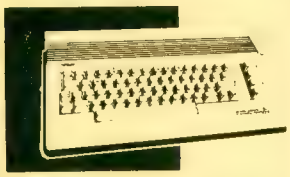

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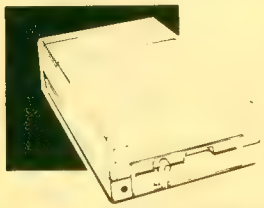

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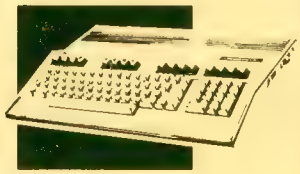

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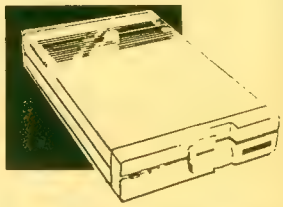

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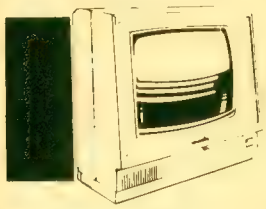

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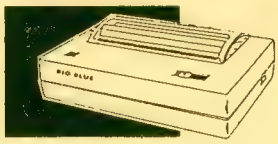

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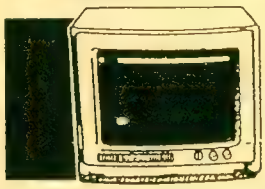

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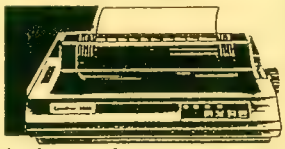

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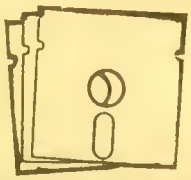

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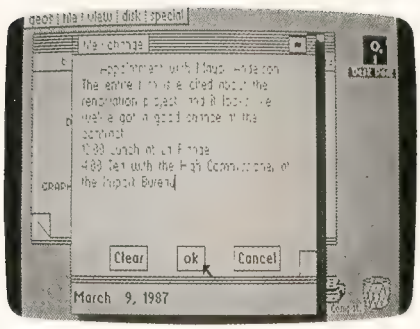
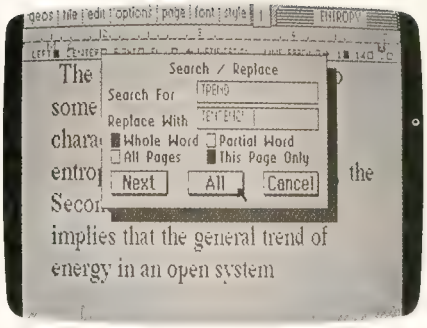


Deskpack's *calendar program offers virtually unlimited storage space for time-critical note making.*



A search-and-replace function is included in geoWrite 2.0.

Deskpack also includes an icon editor that allows users to personally customize *GEOS* icons. The program is easy to use and effective.

The quartet's third member, Graphics Grabber, is a utility which allows the user to copy pieces of art from the popular graphics programs *Print Shop*, *Newsroom*, and *Print Master*. The borrowed images may then be brought under the umbrella of *GEOS* and employed just as though they'd been drawn with *geoPaint*.

The fourth, and possibly most widely useful, application is a calendar, which consists of page images that can be flipped back and forth just by pointing the cursor and clicking a button. Like a paper calendar, each page is devoted to a single month. Once on the correct page, the user can zero in on any particular day and then activate a large notepad into which memo information can be inserted. Days for which notes exist are flagged with a small, iconlike symbol, and a special feature of the program will produce a separate display of all days for which entries have been made. The calendar application operates exceptionally smoothly.

A Significant Upgrade

Another new package includes the first application to reach the 2.0 version stage: *Writer's Workshop*, which includes *geoWrite 2.0*.

The beefed-up edition of *geoWrite* differs from its predecessors (including 1.3) in a number of major ways. Significantly, the program supports a pop-up search-and-replace function which can be an invaluable aid to the writer working with long or complex documents. A search-and-replace routine enables the writer to rapidly scan a document for every occurrence of a certain word or phrase and to take appropriate action when it's found. This feature has been thoughtfully implemented and offers a number of helpful options, among them the ability to restrict the search to a single page.

Other new features include three justification modes, line-spacing options, text-selection shortcuts, printing options, header and footer options, formatting of individual paragraphs, and more. The list, in detail, is actually quite extensive, so here are some highlights. One of the print options allows the much quicker printing of plain-text, draft-quality preliminary versions of documents. For a fairly simple, medium-sized font, a test we performed revealed a fivefold speed increase for draft versus normal printing. The increase would be still more dramatic if a larger and more complicated typeface were involved. Another option configures the system to permit output on printers offering a near-letter-quality mode. Still another enhancement means that text selection for editing is very much faster since any word may now be highlighted by simply pointing at it with the cursor and double-pressing the joystick or mouse button. Keyboard input has also been provided for activating most of the new options.

Writer's Workshop also includes *geoMerge*, a powerful merging program that allows the user to produce a stream of highly personalized documents from just a single basic *geoWrite* file.

The process works like this. The writer first types in the basic document. Any word or group of words can be specially marked. Once the document is complete, any words not marked are locked into the document. The specially marked words act as place holders—ghost words—not appearing in the printed document. The overall effect is like a cardboard mask or template—with the unmarked words fixed, and the ghost words represented by holes cut in the cardboard. *geoMerge* can then process this document and, either automatically or under user control, replace the ghost words with any words the user wishes. The final stage is printing, so the newly added words can be of any length. They're simply called into the printing process as required. As a consequence, two finished documents printed from the same template may differ greatly in length.

Intelligent Merging

Better still, *geoMerge* supports conditional merging. The program will look to see if certain tests are met by the words being merged into the template. According to the results of these tests, various sections of text may be merged into the basic document. As an example, imagine you're going to send a personalized holiday form letter to your friends and relatives. You have an interesting story to tell, but some portions may be need to be edited somewhat for the delicate sensibilities of the relatives. With *geoMerge*, the words, sentences, and paragraphs in question would be added only to those letters which had passed the test for a specific key word. This capability is a real timesaver, and is naturally well-suited to a business environment.

Writer's Workshop also includes the *Text Grabber*, a program that converts text files from other word processors into *geoWrite* format. *Text Grabber* is capable of handling files as well as some formatting information from *SpeedScript*, *PaperClip*, *EasyScript*, and *WordWriter*. There's also an option for translating files from programs other than these, but all formatting must subsequently be done in *geoWrite*.

The final component of this writer's treasure chest is a special printer driver named *geoLaser*, which enables the user to send *GEOS* output to an Apple LaserWriter printer. Output printed in this manner is nearly as crisp as if it

had been generated by a typesetting machine. The LaserWriter is an extremely expensive and highly intelligent machine which has four high-quality fonts built into it. *geoLaser* has been designed to offer support for these fonts, so truly striking output should be possible. Commodore 64 users who contemplate buying a LaserWriter will also need a special RS-232 interface to connect the printer to their computers. Although it's unlikely that many 64 owners will rush out to buy this hardware, the inclusion of *geoLaser* is a clear sign that Berkeley expects the computer community to take *GEOS* seriously and use it in state-of-the-art applications.

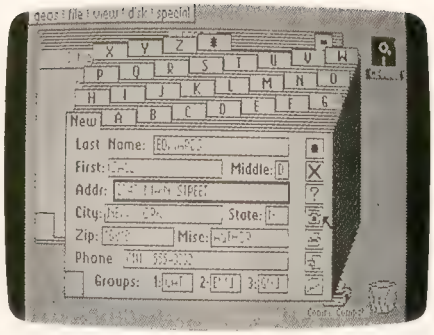
Organizing With *geoDex*

Another of the new inhabitants of the *GEOS* world is *geoDex*, an ingenious filing program.

geoDex is—purely in graphic terms—a realistic depiction of one of the popular card files people use to keep track of names, addresses, phone numbers, zip codes, and so on. This, on the surface, is exactly what *geoDex* does too, but the addition of computer power makes this card file an intelligent and willing servant.

Like a real card file, *geoDex* is divided into sections by alphabetical tabs. Selecting the card group for any particular letter requires nothing more than moving the cursor to the correct tab and pressing the joystick or mouse button. (A special tab denotes information grouped nonalphabetically.) Within an alphabetical section, users can move backwards and forwards between cards with the standard *GEOS* pageturn icon. As an alternative, however, keyboard shortcuts are available for most *geoDex* functions.

All the index cards in *geoDex* have an identical format. There's room to enter information in ten different categories, one of which is classified as *group*. Here, three different three-letter abbreviations may be inserted to denote various connections between the cards. As with real-world card files, there's a limited amount of room on each card in *geoDex*. Also, the program's data fields—areas into which information may be typed—are permanently labeled as for an address and phone number filing system. The



geoDex *is a powerful computer index file.*

first field on each card is titled LAST NAME; the next is FIRST NAME; and so on in a predictable manner. However, although space is restricted—fields hold, on average, approximately ten characters—the user can construct many different sorts of filing schemes. *geoDex* could easily be used as, say, a database for recording various types of plant leaves, for keeping track of a coin collection, and so on. As long as the filer uses the fields consistently, there are no limits to the applications in which *geoDex* might prove helpful.

Once *geoDex* has some information to work with, it offers a number of search options that can be used with entries made in the LAST NAME field. In addition to exact matches of last name, various partial matches can be specified. Further, one *geoDex* icon gives the user access to a separate search function that will select cards according to the entries in the three group subfields. This combination of matching features provides the user with all the necessary tools for searching the card file efficiently.

Easy Address Labels

Printed output from *geoDex* is also thoughtfully designed. Options include phone lists, two kinds of address labels, and complete file information. Printed reports specified by group are also available.

geoDex is rounded out by an autodial function. Using it, computers equipped with Commodore modems can be activated to automatically dial the number in the phone field on any selected index card. The *geoDex* package also includes *geoMerge*. As mentioned earlier, *geoWrite* is used to produce the template document for this merge program. However, *geoDex* can be used to create files that will automatically fill in the ghost words in the template. As a consequence, it's possible to dash off a form letter for your entire *geoDex* file or for one of the smaller groupings within it.

The final currently available *GEOS* product is, in contrast to all the others, a hardware enhancement, the geoPrint cable. This device—a six-foot long parallel printer cable—will directly connect the *GEOS*-equipped 64 to a large number of popular printers. The cable is packaged with a disk that carries a number of printer drivers enhanced and improved to take advantage of the cable's potential. For a system correctly configured for the cable, no printer interface card is required. Although the cable will reportedly speed up the performance of some printer/computer combinations, the main effect seen in tests we performed was a marked improvement in printout quality. (A word to the wise: Be certain that your printer will work with the cable *before* purchasing it.)

Just Around The Corner

Although *GEOS* has been likened to a world, it's clearly a part of the Commodore universe; and one key element in the future of the system is being supplied by the computer manufacturer. This element, too, is a hardware enhancement, the 1764 RAM expander for the 64. The expander offers an additional 256K of memory and has its own power source. According to Commodore, the expander should be widely available by the time you read this. Brian Dougherty himself believes that *GEOS* cannot really be seen at its absolute best without the RAM expander.

One of the components in the basic *GEOS* system at the 1.3+ level is the *configure file*. This program, which may be accessed and reset at any point in a *GEOS* session, automatically recognizes whether RAM expansion is attached and offers a number of customizing options for use with it. Once expander memory is set up as desired, the user needs only to transfer the appropriate programs and documents to it. From that point on, the expander works without further user intervention.

We've worked extensively

with a prototype expander and *GEOS*, and it appears that Dougherty's enthusiasm is not misplaced.

One truly impressive demonstration of the power of the *GEOS*/expander combination comes when scrolling through a *geoPaint* document. Using this combination, the movement is rapid—almost instantaneous. Since the entire document can be held in the expander's memory, disk access is not necessary during the process. Also contributing to the improvement in speed is the expander's Direct Memory Access (DMA) capability. This simply means that the expander has the ability to move the contents of large chunks of memory around much faster than can be done within the 64. Thus, desk accessories pop up and down instantly, and even some of *geoWrite*'s slower features are noticeably faster.

The expander memory can be increased to 512K, and *GEOS* will also recognize this configuration. This extra memory adds a vast, unexplored territory to the *GEOS* world, and it's impossible to foresee the many uses to which it will undoubtedly be put.

Major Applications

Currently waiting in the wings are two very powerful application programs from Berkeley: *geoCalc*, a large spreadsheet, and *geoFile*, a database in which the user has total control over the highly flexible data-entry displays. Although we were not able to test these programs, their specifications are more than impressive. Dougherty is pleased with these products, and they should both be available by the time you're reading this. Although both applications will work on an unexpanded 64, these new workhorses reportedly gain a great deal when combined with the 1764. Naturally, the new programs are compatible with the rest of *GEOS* and will offer several options for interprogram data exchange.

Also completed, and merely awaiting documentation, is the long-expected *GEOS 128*—for use solely in the 128's 80-column mode. Berkeley initially had some reservations about embarking on this project, fearing that the 80-column video chip might create insoluble display problems. However, as it turned out, the 128's fast mode, combined with parallels between that machine's video display and Berkeley's graphics coding, has resulted in an excellent new product, according to Dougherty. He now uses the 128 version almost exclusively. A special version of *geoWrite* to support this system will be shipped with *GEOS 128*.

Into The Crystal Ball

There is a good deal of obvious activity at Berkeley, and the pace there is apparently not slackening a bit. Dougherty reports that a number of programs are heading through the pipeline in various stages of completion. One of these is *geoProgrammer*, an assembly language programming environment designed to take advantage of the entire *GEOS* system. A unique aspect of this application will be its ability to incorporate graphics from *geoPaint*. These will then be coded for display during assembly. Another interesting product in the wings is *geoPublish*, a comprehensive page-layout application for those working on high-quality desktop publishing operations. Further from completion is *geoBASIC*, a *GEOS*-specific form of the popular language, and one for which Dougherty promises a lot of extras. Also coming is *geoSpell*, a feature-laden spell-checking program. Berkeley will also release a pattern editor for use with *geoPaint*, and a font editor which will allow users to create their own personal typefaces. Interestingly, the font editor was not created at Berkeley. The company found it on QuantumLink and was so impressed with its quality that they licensed it.

Although it's undetermined when these products will actually see the light of day, they indicate that Berkeley is continuing to expand *GEOS* in many directions, some of them perhaps unexpected. Dougherty has a couple of mysterious projects under wraps, and would not offer any clues as to their nature.

Overall, *GEOS* has enjoyed a successful first year. The system's reception has been good in the U.S., and probably even better in Europe. Support from third-party software publishers has been a little thin, but Timeworks has released a number of *GEOS*-compatible products. QuantumLink has proved a useful channel for Berkeley, and through it the company even offers an inexpensive laser-printing service for *GEOS* users with a yen for top quality. And, as *GEOS* has taken hold, at least one independent *GEOS* laser-printing service has sprung up. Dougherty welcomes the competition and would be delighted to see more.

All the signs and portents are good, and there seems little doubt that *GEOS* has caught on in a big way. Moreover, Berkeley appears to be making every effort to expand its new world in useful and inventive ways. At the moment, the future looks bright for *GEOS*. And that, happily, insures a parallel course for the ageless 64.

New *GEOS* Column

We are pleased to announce a new department, "The *GEOS* Column," which will debut in the September issue.

Unlike most other GAZETTE columns, "The *GEOS* Column" will not have a fixed format. One month, it might consist of useful snippets of information—on the order of "Hints & Tips." Another month, we might present a short *GEOS*-oriented program—such as those found in "Power BASIC." We'll also publish overviews of new products as they become available, and offer occasional comments directly from Berkeley Softworks, the creator of *GEOS*.

If you have a technical bent, you are encouraged to send short, *GEOS*-specific tips and program submissions directly to "The *GEOS* Column" in care of this magazine. (For article or program submission formats, see "COMPUTE!'s Gazette Author's Guide" elsewhere in this issue.) Payment will be determined by quality and length of the submission. However, please note that space restrictions prevent us from publishing excessively lengthy articles or programs.

Murder Party

Love a mystery? Maybe you've heard of a recent phenomenon in good times: the mystery weekend. Most often marketed as a weekend getaway package, it involves a stay at a hotel (sometimes a cruise or train trip is substituted), meals, and murder, mayhem, and mystery. Actors are hired to play out the principal roles in scenarios written specially for the occasion. There may be lots of "bloodshed," and clues are strewn about for the mystery-weekend participants to observe and interpret. The objective is for the players to solve the mystery and name the murderer. The culprit is publicly apprehended, usually at a climactic table feast at the close of the weekend. By all reports, these getaways are just as much fun as they sound, with only one drawback: cost. A recent such weekend at a popular hotel cost $250 per person, based on double occupancy rates.

Of course, this is only the commercial form of the murder party. These parties have been popular in Europe and the United States for decades, but for many people they're difficult to give, as they can involve a rather healthy outlay of time and money. Hosting your own murder party means either devising a script to follow or purchasing one already written, and perhaps hiring the actors to portray it. Even if you find a mystery story to use at a party, it takes some creative effort to tailor the roles to fit your guest list.

On the other hand, with the help of Electronic Arts, you can effortlessly host any number of your own murder parties for only the cost of a stack of paper and whatever refreshments and party accessories you choose to provide. The help Electronic Arts offers is a new program called, simply enough: *Make Your Own Murder Party.*

Murder Party supplies you with the scenario, invitations, clue booklets, and instructions for your party. These materials are all customized to fit your guest list, incorporating nicknames and physical and character traits which you enter prior to printing. It also randomly chooses which of your guests is to be the murderer. Since this selection is made anew for each party, and since your computer is programmed not to tell who the murderer is, you can have an almost unlimited number of parties. Best of all, the computer's job is finished when you're through printing. It doesn't have to come to the party. So you can have your murder party at home, on a boat, at a picnic, or anyplace that will accommodate your group.

. . .the computer's job is finished when you're through printing. It doesn't have to come to the party. So you can have your murder party at home, on a boat, at a picnic, or anyplace that will accommodate your group.

There are currently two volumes of *Murder Party;* each has two party scenarios on disk. Each party is set up for six to eight participants, although extras can be assigned the role of audience. Volume I contains both The Big Kill, the murder of an actor by one of his former sixties-era Berkeley housemates, and Empire, the murder of a wealthy matriarch by a member of her combined personal/corporate family. Details about *Murder Party II* can be obtained by mailing in a card packaged with Volume I.

Murder Party is not for everyone. The ideal host should enjoy role-playing games, be an avid armchair detective, and be a person who enjoys throwing herself or himself into a good time. And, just as importantly, the prospective host should be able to choose party guests with the same traits. If you can fit this description, then *Murder Party* is for you. Merry mayhem!

—Robin Minnick

Make Your Own Murder Party
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$32.95

Bureaucracy

"Students who exchange digital watches with multiple partners increase their chances of contracting bubonic plague by 300%." This quote is from *Popular Paranoia* magazine, to which you'll probably want to become a subscriber after playing a few rounds of *Bureaucracy,* Infocom's latest excursion into interactive fiction.

This time, however, it may not be fiction. They really are out to get you, to make your blood pressure rise to the point of apoplexy, to shatter your complacency, to hold you forever in a gridlock of red tape, to make you a nonperson.

And all because you probably mishandled your change-of-address card.

Designed by Douglas Adams—author of *Hitchhiker's Guide to the Galaxy—Bureaucracy* is said to have been inspired by an experience Adams once had when he found out his bank had invalidated his credit card. In this game, the offending institution is the Fillmore Fiduciary Trust, a savings and loan/bank card/moving and storage company, which seems to control almost everything, everywhere. You begin the game by filling out a software license which—in mixing up the usual order of requested information, such as last name, least favorite color, name of previous friend, first name, and so on—sets the tone for the game.

Although the parser will take this information and blend it into the story, you'll find it continually confusing your gender and, from time to time, confusing other items of information, given that modern bureaucracies are made possible by computers, and that computers are notoriously inept at processing information.

What is surprising is that your transfer to a new town and a new job hasn't gone quite as smoothly as you had expected. Because the change-of-address card has somehow gone astray, you find yourself in your new home bereft of all possessions save those few you carried with you. The moving and storage company experienced a glitch in the flow of information, but having been informed of the mistake, has promised to set things right within a week.

Perhaps it won't matter. In your

possession is a letter from your new employer informing you of a training meeting in Paris. Following the training, you'll have a full week to enjoy yourself in the City of Lights, and all your possessions should certainly be in place by the time you return.

All you must do is visit the offices of Happi Tech and get to the airport to board the plane to Paris. This is, of course, an easy task to accomplish. It only becomes difficult when you find that, as a result of the mishandled change-of-address card, you have become a nonperson. You'll find yourself contending with a macaw, who may be guarding important mail that should have been delivered to your new home. There's also a contemptuous travel agency clerk who is more than willing to ruin your vacation, a deaf old lady with an elephant gun who may be part of a conspiracy, and other assorted characters, all of whom seem intent on making your blood pressure rise.

As Bureaucracy *is played, your blood pressure is displayed at the top of the screen. . . . Any irritation, even that of misspelling a word or of using a word the parser cannot understand, will cause a rise in pressure. . . . Your actions in the real world directly affect your character in the game.*

As *Bureaucracy* is played, your blood pressure is displayed at the top of the screen. When you enter a stressful situation, you'll hear a beep and see a message that your blood pressure is going up. To lower the pressure, you must make less stressful moves, giving the game a quality in common with biofeedback machines. Any irritation, even that of misspelling a word or of using a word the parser cannot understand, will cause a rise in pressure, and this has the effect of making you more directly involved with what would normally be happening only inside your computer. Your actions in the real world directly affect your character in the game.

As written for the Commodore 128, *Bureaucracy* is self-booting and requires an 80-column display monitor. Although the program uses both sides of the disk, it was written to be compatible with the 1541 disk drive, making it necessary for you to turn the disk over at one point during the loading process.

Even though many of your typed-in commands will require your computer to access the disk before replying, the process seems quick. Further, Infocom seems to have improved what was already one of the best parsers in the field, making it possible for you to type in commands such as, "Take the equipped card from the case and put the card in the cartridge slot."

Documentation is something Infocom has always taken seriously, and they show this by including documents. For *Bureaucracy*, the documents consist of a pamphlet on moving (courtesy of Fillmore Fiduciary Trust). Had you read the several pages of instructions on the proper way to fill out a change of address form (included) and used the proper pencil (also included), you'd not be in the mess in which you now find yourself. There's also a prospectus for *Popular Paranoia* magazine, which includes the little-known fact that the state of Delaware is fictional. For those new to Infocom adventures, there's also an extensive section dealing with how to play the game and how to communicate with the parser. Older hands may jump right in, exercising their eagerness to experience frustration. At the end of the game, you'll be given your score, the number of points you achieved out of a possible 21. There's also a brief summary of the results of the final move, and if any of these have resulted in your death, either from a stroke or other process, you'll at least have the consolation of knowing that your blood pressure has now been lowered to zero over zero.

—Ervin Bobo

Infocom
125 Cambridge Park Dr.
Cambridge, MA 02140
$39.95

The Final Cartridge

Simply put, the new Final Cartridge, from H & P Computers, is an outstanding addition to any Commodore 64 or 128. I can't begin to think of a cartridge which does so many useful things for the average home computerist/programmer. I keep it plugged into my 64 almost all the time; it works as well on the 128 (automatically booting it to 64 mode).

Everyone who uses this cartridge will have his or her own favorite features, and there are many from which to choose. Those that top my list are: turbo-load (with DLOAD short-form command), turbo-save (short-form DSAVE), DOS wedge at your fingertips, AID utilities, and programmed function keys—including instant-access disk directory (listing to the screen). In my opinion, these items alone are worth at least the price of the cartridge. The function keys are programmed so you can literally hit a single key to list a disk directory, cursor up to the line of the program you want to load, push another key, and—once the program turbo-loads—either list or run it by pressing a third key. Turbo-load—for which the format is identical for BASIC or ML—even prints beginning and ending program addresses.

I can't begin to think of a cartridge which does so many useful things. . . .

For BASIC programmers, the turbo-save and load (up to five times faster than normal) is especially welcome; ML enthusiasts will be equally taken by the extended monitor—similar to Supermon—which scrolls (and disassembles) *backward* through memory as well as forward. They may appreciate as well the hex-decimal conversion feature and the capability to specify decimal values within the monitor. Those who like to work with disks directly will also value the inclusion of a *disk* monitor.

The AID commands include most of the important ones: AUTO line numbering, DELete line ranges, RENUMber entire programs (not ranges), FINDing strings and variables, APPENDing from tape or DAPPENDing from disk, plus DOS" to access disk commands (including the disk error channel). (DOS" is fortunately one of the programmed function keys.) One could only wish for a CHANGE command, and that DAPPEND might MERGE instead. (In fairness, I should point out that *manually* CHANGEing is much easier with FIND, and that short manual MERGEs are no particular chore with DAPPEND—which adds material only to the end of a program.)

Another simple yet valuable command is OLD. It is particularly helpful in recovering a BASIC program after a machine language crash. The Final Cartridge includes two buttons: One is a *reset* switch, the other is a *freeze* (see below). Pushing *reset* and then typing OLD will recover from most crashes. *Reset* is also helpful when, for whatever

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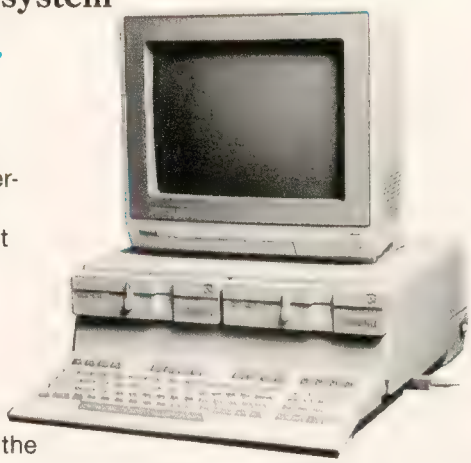

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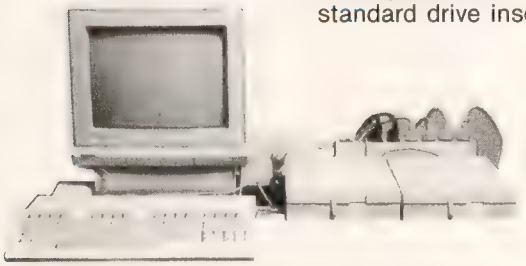

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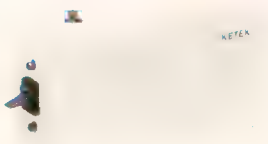

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you have KILLed the cartridge. *Reset*, then OLD, reenables the cartridge with your BASIC program intact.

One of the few times it is necessary to KILL the Final Cartridge is when your program requires you to frequently press the RUN/STOP–RESTORE key combination. On the 64, I found that this action will cause a crash an average of once every 20 to 40 times. (It could be the first or second time, or not until the fortieth keypress; there is no apparent pattern.) Strangely, it does *not* occur with the 128. The cure for this problem is simple: KILL the cartridge, and reenable it with *reset* and then OLD when you again need cartridge facilities.

Among the many other valuable features is a *freeze* archival backup for protected disks or tapes. Although I am not a "freeze" aficionado, I can report that it worked very satisfactorily on one protected game. The freeze button accesses several menus and many options, and allows saving to tape or disk. It also permits killing sprite-to-sprite and sprite-to-background collision detection. Note, too, that previously "frozen" programs turbo-load from tape or disk, even when copy-protection disallows fast loading originally.

I have not tested the built-in Centronics printer interface, which requires a special cable from the user port to the Centronics port on an appropriate printer. With such a cable (available from H & P Computers), you can do high- and low-resolution screen dumps, print Commodore graphics characters, and, in short, do everything that can be done with a Commodore printer. (I should mention also that, for printers with more than a one-line buffer, a *type* mode permits you to dump onto your printer everything you key in the computer prior to pressing RETURN.)

Besides the CHANGE and MERGE utilities mentioned above, I can think of only two features I wish the Final Cartridge included: a program *copy* facility (perhaps along with a fast disk format), and a more convenient direct disk monitor.

Documentation, though modestly packaged, is clear and thorough. The binder is loose-leaf, easily permitting updates and revisions by H & P.

Commodore 128 owners should know that the Final Cartridge is partly incompatible with the 1571 disk drive (there are no problems with the 1541). The turbo-DLOAD returns a program filled with errors (no drive error is indicated), though DSAVE (turbo) and DVERIFY both work fine. This fact is enough to recommend against pairing the cartridge with a 1571 drive, though again there is a cure: Do a normal (long) LOAD after disabling (KILLing) the cartridge; then press the reset switch and type OLD. The Final Cartridge is reenabled. *[A spokesman for H&P Computers acknowledges that there is partial incompatibility with the majority of 1571 disk drives produced by Commodore prior to this spring. The incompatibility is caused by the ROM chip used in the 1571. However, the new 1571s will have an upgraded ROM that will correct that problem.—Ed.]*

In this review, I've noted only the Final Cartridge's main features. I should also mention the monitor's ability to bank-switch, and the *memory-read* and *memory-write* commands which permit BASIC to access data under ROM—24K of normally inaccessible RAM. And I might add that the cartridge does all these things without tying up any user RAM.

The Final Cartridge is a tremendous value, a *must* item for the BASIC and machine language programmer.

—Art Hunkins

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Killed Until Dead

At this point in the short history of the home computer, a game has to offer something new if it is to succeed. Text adventures use increasingly large parsers; war games offer myriad options; and arcade games merge strategy with action in new and addicting ways.

The game uses all the capabilities of the 64; it offers an excellent user interface; and it is both challenging and genuinely entertaining.

The games that catch on, though, are almost always those that make full use of the capabilities of the computer they are designed for. In the case of the Commodore 64, with its excellent graphics and sound, that requirement forces the designer to be especially creative.

From the start, Accolade's design philosophy has reflected the need for each game to push the machine to its limits. A quick look at the flyer accompanying Accolade products shows games such as *Hardball*, *Psi-5 Trading Company*, *Dambusters*, *Mean 18*, and *Ace of Aces*, each of which could serve as an advertisement for the 64's graphics and sound. Now comes *Killed Until Dead*, a game mixing these capabilities with an excellent user interface that allows the game to be both complex and easy to play.

Killed Until Dead, as its name suggests, is a murder mystery game. In it, you play the role of Hercule Holmes, one of a group of famous mystery people assembled at the Midnight Murder Club. Sometime during the night, one of the people will be murdered. Your job is to find out who is about to die, and to prevent the murder.

To do so, you have at your disposal several devices. The screen showing the desk displays files, a notepad, a telephone, and a Surveillance sign. An onscreen hand points toward one of them. To select a device, you simply move the hand with your joystick and then press the fire button.

Each device opens a separate series of screens. When you make a phone call, for example, the screen lists the people you can call. Once you select a person, the screen shows his or her picture and gives you a series of questions you might ask. If you choose the right question, the suspect's picture changes to display greater anxiety. In fact, as you get closer to an accusation, the suspects' faces continue to change, and you can gauge your progress by watching these changes.

The Surveillance screens are especially impressive—they allow you to monitor any room in the Club, break in to a bedroom to look for clues, or videotape an encounter between two of the suspects. To videotape, you set the recorder to monitor a specified room at a certain time, much as you set a video cassette recorder to tape a television show at home. Because meetings will often coincide, learning to use the tape machine is important, as it is your most reliable means of spying.

Each of these functions is well-designed, but *Killed Until Dead* offers further proof of the designer's concern for the user. With all the conversations to keep track of, whether through phone calls or taping and monitoring, the game could quickly become unwieldy. Unlike many games, though, *Killed Until Dead* includes an automatic note-taking system. Every phone call, every conversation, and every clue is automatically recorded in the notepad that rests on your desk. To remember all the details—the times of meetings, the substance of conversations, the contents of rooms—you need only look in the notebook. Furthermore, much of the information can be sorted whatever way you find useful. What this means, of course, is that you don't have to write

anything down. Record keeping is probably the single-most aggravating feature of any game, and has in fact destroyed my interest in several promising games. By eliminating the need to keep records, *Killed Until Dead* demonstrates a belief that gaming is entertaining, not tedious.

When all is said and done, though, a game must offer more than just a good interface, no matter how superb that interface is. *Killed Until Dead* is challenging, and it offers several different scenarios and four separate skill levels. The idea of the game is to piece the clues and conversations together to come up with a solid accusation. And guessing isn't allowed. If you accuse without a sound-enough base of suspicion, you end up being the one who is killed until dead.

So far, I've made the game sound extremely serious. It isn't, though. Filled with both good and bad jokes, theme music from many mystery movies, and excellent caricatures of famous mystery characters, the game resembles the board game Clue more than anything else. It is considerably more complex than Clue, and it uses an entirely different system, but your mission—to link killer, weapon, and victim—and the logic required to solve the cases are reminiscent of the board game. The game uses all the capabilities of the Commodore 64; it offers an excellent user interface; and it is both challenging and genuinely entertaining. *Killed Until Dead* fits in well with Accolade's impressive line of 64 software.

—Neil Randall

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Buzzword

As home computers come of age, more and more games are being developed to meet the diverse tastes of the family. With these have come a number of games reminiscent of old precomputer favorites, such as the board game Monopoly, the parlor game charades, and skill and thinking games like Scrabble or Trivial Pursuit. The newer computer games, instead of placing the computer at center stage the way standard videogames do, use it as an adjunct, an aid to the best source of good times: the interaction of family and friends.

Buzzword is a solid example of this kind of game. It stimulates, it teaches, and it's fun. Geared to those ages ten and up, it provides challenging entertainment for the whole family. In *Buzzword*, the computer randomly selects nine words in a category you have chosen. It then displays letter and number clues for each word: The letter clue is the first letter in the word; the number tells you how many letters comprise the word. Below this display is a small window listing the letters of the alphabet that are used in the answers, and their frequency. The object is simple: Guess the word and type your guesses onto the screen. A small typewriter at the bottom of the screen records your guess as if on a sheet of paper, its keys moving as you type. Wrong answers are buzzed and disappear. Correct answers remain, and the page scrolls up. When your guess is correct, your letter and number clues disappear, the list of letters used is revised to show only those used in remaining answers, and your score is recorded.

A major part of *Buzzword* is the category card. There are 200 categories in the *Buzzword* sampler, 40 different categories for each of five subject areas: Hickory Stick (things taught to the tune thereof); Play on Words (as it says); Leisure World (recreation and entertainment); Fun for All Ages (devised with the aid of an eight-year-old and her younger sister); and Buzzword Connection (a special category). Each category is represented by a numbered card that describes it with a catchy title and phrase. The answers, up to 50 of them, are listed on the card's back. You review the card before playing the category in order to see what answers the computer is drawing from. (We let younger players check the card periodically during the game. You could play without looking at the card at all, but that's masochistic.)

It stimulates, it teaches, and it's fun. Geared to those ages ten and up, it provides challenging entertainment for the whole family.

Because the computer selects the answers randomly, it's possible to play categories repeatedly without danger of knowing all the answers. There is even a replayability factor telling you how often you can safely replay a category printed on the front of each card.

The categories themselves are clever. For instance, "No Nutrition. Things other than food that people put in their mouths." Or, "Me In Mind. What you come with when you're born (body parts)." And "Blue...Connections. Words and phrases beginning with the word blue."

The substance of *Buzzword* is, of course, words, but your sequence of choices is what makes the game. The first of these is a selection of categories; then, by choosing one of four modes in *Buzzword*, you decide what clues are available: both the first letter of the answer and the length of the answer, only one or the other, or neither. You can also choose whether or not the computer will display the frequency of each letter in the set of remaining answers. You can play the game in singles or doubles mode, and with the timer on or off. By manipulating these options, *Buzzword* becomes 32 games in 1.

Buzzword can be played at any one of three levels: bright, nimble, or gifted. Each of the answers on the category cards has its level number printed next to it. When playing the round at level 1, only level 1 words are chosen by the computer as answers; at level 2, both level 1 and 2 words are used, and so on. Any round may be played at any level.

Your final choice is in strategy. The game is played four rounds at a time—three regular rounds followed by a bonus round. You have a choice of playing or passing on the bonus round. If you play, you race against the clock to unscramble each answer as it appears on the page in the typewriter. For some people, passing is the better part of valor.

The scoring method figures in strategy, too. A trifle complicated but amply explained in the manual, it enables you to go for words that will score you the most points. As we said, choice makes the game, but basically, *Buzzword* is a word guessing game, creatively devised to take advantage of the computer's randomizing and mathematical capabilities. It's a game developed with a great deal of thought and care.

Best of all, *Buzzword*'s flexibility allows you to handicap more talented players, so anyone can play. Even players younger than the suggested ten years can play, if they're able to read.

Buzzword is a big hit with our family. It bills itself as ranging "from a simple word guessing game...to a sophisticated strategy-filled test of your knowledge," a game to "appeal to trivia buffs, word game aficionados, and puzzle-solvers." It is. It does. The mental exercise of *Buzzword* sharpens wits, and has enlarged our daughter's vocabulary and spelling skills.

—Robin and David Minnick

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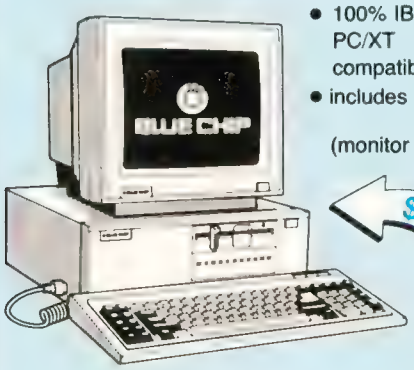

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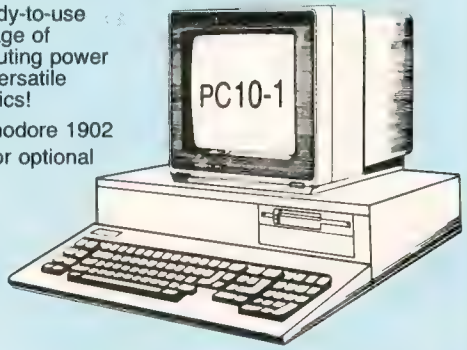

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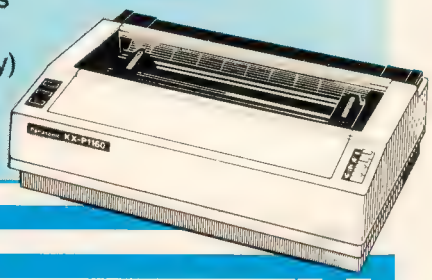

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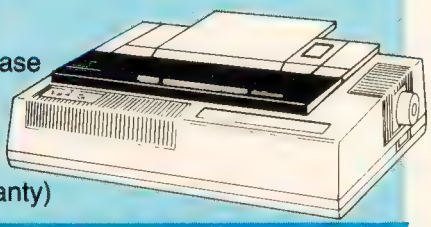

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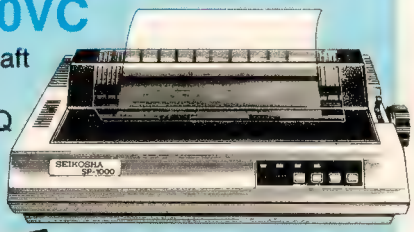

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User Group Update

This list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1987 issues.

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Send typed additions, corrections, and deletions for this list to:

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User Group Notes

Stockton Commodore User's Group has changed its address to P.O. Box 8354, Stockton, CA 95208.

The **Triad C-64 Users Group** has changed its name to **Triad Commodore Users Group (TCUG)**. The group also now includes the Amiga.

New Listings

ALABAMA

Commodore Club South, Inc., P.O. Box 324, Birmingham, AL 35126

Amiga/Commodore Club of Mobile, 3868-H Rue Maison, Mobile, AL 36608

ARIZONA

C64/128 Information Exchange Group, 1345 S. Kolb Rd #345, Tucson, AZ 85710

CALIFORNIA

C128 West Commodore 128 User Group, 2917 Colorado Ave., Santa Monica, CA 90404

Commodore Users, Buffs, & Enthusiasts, 5115 Via Veranada, Long Beach, CA 90805

Rosemead Associated Members (RAM), 2636 Willard Ave., Rosemead, CA 91770

West Orange County Commodore User Group, 20311 Ravenwood Ln., Huntington Beach, CA 92646

South Orange Commodore Klub (SOCK), 2401 Champlain Rd., Laguna Hills, CA 92653

Southern Orange County Commodore Komputer Services Group (SOCCKS), The Wizard's Exchange, 24212 Hollyoak Ln., Apt. D, Laguna Hills, CA 92656

ACCESS, 5328 Charlotte Wy., Livermore, CA 94550

Commodore Hayward Users Group, P.O. Box 2072, San Leandro, CA 94577

Sacramento Commodore Computer Club, P.O. Box 13393, Sacramento, CA 95813-3393

COLORADO

Ft. Collins C3, 1625 Centennial Rd., Ft. Collins, CO 80525

CONNECTICUT

Hartford Area Commodore Society (HACS), c/o Mark Trencher, Aetna Life & Casualty Co., 151 Farmington Ave., A441, Hartford, CT 06156

The Naugatuck Valley Commodore Users Group, P.O. Box 622, Waterbury, CT 06720

South Kent Users Group (SKUG), Box 97, South Kent, CT 06785

FLORIDA

Bay Commodore Users Group (BCUG), P.O. Box 3187, Panama City, FL 32401

Starcom User's Group of Martin County, P.O. Box 1446, Port Salerno, FL 33492

Brandon Users Group, P.O. Box 351, Brandon, FL 33511

GEORGIA

Middle GA C-64 User Group, 104 McKinley Dr., Griffin, GA 30223

Athens Commodore Users Group, One Beech Haven, Athens, GA 30606

Albany Commodore Amateur Computerist, P.O. Box 5461, Albany, GA 31706-5461

IDAHO

Pocatello Commodore Users Group (PCUG), Rt. 2, Box 48E, Pocatello, ID 83202

Eagle Rock Commodore Computer Club, P.O. Box 3884, Idaho Falls, ID 83403-3884

ILLINOIS

SouthWest Regional Association of Programmers/64 Users Group (SWRAP/64), P.O. Box 342, Bedford Park, IL 60499-0342

INDIANA

Indiana Dunes Commodore Users Group (IDCUG), P.O. Box 2021, Michigan City, IN 46360

Kosciusko Commodore User's Group, 1721 S. Latta St., Warsaw, IN 46580

Commodore Small Town Users Group (CMTUG), P.O. Box 161, Vevay, IN 47043

Western Indiana Commodore Users (WICU), P.O. Box 1898, Terre Haute, IN 47808

IOWA

Basic User Group Support (BUGS), 710 Foster, Ottumwa, IA 52501

KANSAS

First Commodore Users Group, 606 East Chippewa, Paola, KS 66071

Pittsburg Micro User's Group (PMUG), SRS Blds, 20th & Bypass, Pittsburg, KS 66762

LOUISIANA

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Northeast Louisiana Commodore User's Group, P.O. Box 581, West Monroe, LA 71294-0581

PAGE U.G., P.O. Box 7703, Alexandria, LA 71306-7703

MARYLAND

Harford County Commodore Users Group (HCCUG), P.O. Box 209, Fallston, MD 21047

MICHIGAN

Saginaw Area Commodore Users Group (SACUG), P.O. Box 6606, Saginaw, MI 48608

The Almighty Commodore Users' Group of West Michigan, 13510 16 Mile Rd., Gowen, MI 49326

MINNESOTA

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Central Minnesota Computer Users Group (CMCUG), 221 26th Ave. N, St. Cloud, MN 56301

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West Lacrosse Commodore Club, 1809 Bainbridge St., Lacrosse, WI 54603

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South Australian Commdore Computer Users Group, P.O. Box 427, North Adelaide, SA 5006, Australia

VIC-UPS Computer User Group Inc., P.O. Box 178, Nedlands, Perth, WA 6009, Australia

CANADA

Castlegar Commodore Computer Club, RR 1, Site 37, Comp. 7, Castlegar, BC, Canada V1N 3H7

Moncton Users Group, Box 2984, STN A, Moncton, NB Canada E1C 8T8

United North America Users Group, Box 8, Site C, Bishop's Falls, NFLD, Canada A0H 1C0

NEW ZEALAND

New Zealand Commodore Users Group, P.O. Box 2828, Wellington, New Zealand

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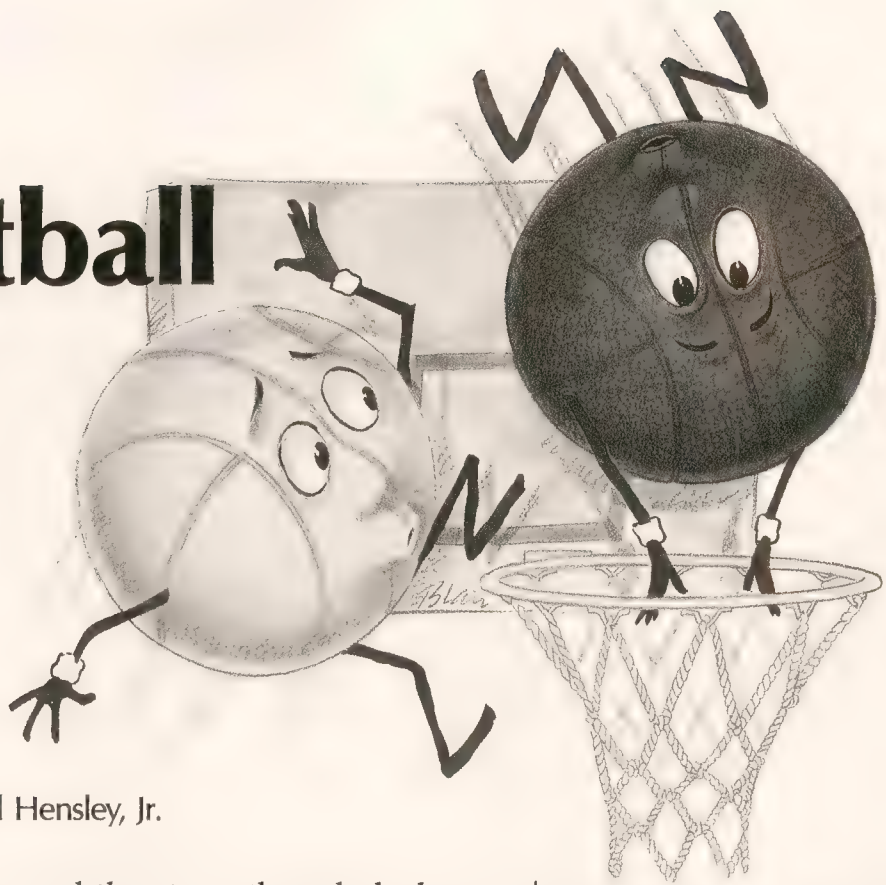
Salvador Pou, Paseo Doctor Moragas 204, Barbera Del Valles 08210, Barcelona, Spain

Basketball Sam & Ed



Rhett Anderson and David Hensley, Jr.

What better way to score a goal than to go through the hoop yourself? This delightfully clever arcade-style game for the Commodore 64 is guaranteed to provide hours of entertainment for young or old. Included are one- and two-player modes. Excellent playability and outstanding graphics and sound make "Basketball Sam & Ed" a must for any game lover. One joystick is required for the one-player mode; two are required for the two-player mode.

"Basketball Sam & Ed" is a whimsical version of one-on-one basketball that can be enjoyed by the whole family, young and old. Although the game is most fun when played by two people, a computer opponent is always ready for the challenge.

Basketball Sam & Ed is written entirely in machine language, so you'll need to use the "MLX" machine language entry program found elsewhere in this issue to enter it. When MLX asks for a starting and ending address, respond with these values:

Starting address: 0801
Ending address: 18C0

Be sure to save a copy to disk or tape after you finish typing. Name the program *SAM & ED* if you wish to be able to use the accompanying Basketball Sam & Ed Customizer program. (See below.)

Tip-off

If you plan on playing the two-player version, plug two joysticks into the joystick ports *before* you turn on the computer. If you're playing against the computer, use a joystick plugged into port 2.

Although Basketball Sam & Ed is a machine language program, it can be loaded, saved, and run just like a BASIC program. When you're ready to play, load the program and type RUN. The program prompt asks *ONE PLAYER OR TWO?* Respond by pressing 1 or 2.

At the top of the screen is a scoreboard that shows Sam's score, Ed's score, the period (1–4), and the amount of time left in the period. A scrolling message board provides you with announcements and important information about the game.

Sam and Ed, true to their dedication to the sport, are basketballs—with arms, legs, and faces. Sam is the orange ball and Ed is the blue one. In one-player mode you control Sam, while the computer handles Ed. This mode offers a good way to learn to play Basketball Sam & Ed, since the computer plays a little better than most beginning players. In two-player mode, Ed is controlled by the player using the joystick in port 1. Sam is controlled by the player using the joystick in port 2.

The joystick controls are easy to learn. You can run either left or right by moving the joystick in the appropriate direction. To jump, press the fire button. You can jump to the left, the right, or straight up into the air, depending on the direction of the joystick when you press the fire button.

As in real basketball, the only way to score is by shooting the ball through the hoop. In Basketball Sam & Ed you can score in any of the three goals. Since you can't jump high enough to score by going through the hoop, you'll have to bounce off of your opponent. It's not uncommon to bounce off your opponent, the floor, and a backboard before scoring—any way that you can make it into the basket

counts. As in the real game, each goal is worth two points.

Once you're airborne, you have no control over your path, so you'll have to time your jump just right to score. If you miss with your jump, your opponent may be able to take advantage of your helpless bouncing to score.

The game begins with Sam and Ed bouncing wildly around the screen. When both players land on their feet, the first of four periods begins. Each period lasts for 10 game minutes, which is equivalent to about 2 minutes and 40 seconds in realtime. At the end of each period—when the timer reaches 00:00 and you hear "Sweet Georgia Brown"—the players lose control of Sam and Ed, but if either scores before he stops bouncing, the goal counts.

If the score is tied at the end of the fourth quarter, an overtime period, which is the same length as a regular game period, must be played. You'll be given as many overtime periods as you need to determine a winner.

When the game ends, the screen freezes so that you can view the score. To start a new game, press any key. If no key is pressed after approximately 15 seconds, another game begins automatically.

Press the Commodore key to pause the game. Press it again to resume play. RUN/STOP/RESTORE stops the game. Type RUN to restart.

Strategy

Basketball Sam & Ed looks and plays like an arcade action game, but after playing a few games you'll develop strategies. Most players eventually come up with their own "plays"—ways of timing their jumps so that they score or keep their opponent from scoring. For example, it's possible to block a goal-bound opponent by hitting him with the side of your head as he bounces on the ground. It's also possible to score two baskets in a row after your opponent scores one. Both moves (especially the latter one) demand quick thinking and some practice.

Keep your eye on the clock and don't forget to make that last scoring attempt as time runs out.

Customizing The Game

If you use a black-and-white TV or monitor to play Basketball Sam & Ed, you may not be able to tell Sam and Ed apart. To solve this problem, we've included a customizing program written in BASIC. You can use this program to make your own modifications. (A disk drive is required to use this program.) The screen colors and the body and feature colors of both Sam and Ed can be changed. Three of the scrolling messages can also be changed. You can also make the periods shorter so the game takes less time to play.

Type in Programs 2 and 3 (using the Automatic Proofreader program found elsewhere in this issue), and save them on the same disk as SAM & ED (Program 1). You should save Program 3 with the name S & E CUSTOMIZER, since this is the name Program 2 attempts to load (line 40). Then load and run Program 2, the Basketball Sam & Ed Customizer Loader. This program will first reconfigure memory, then automatically load Program 3. (Do not run Program 3 directly—certain BASIC pointers need to be set by the customizer loader, Program 2.) Follow the instructions and prompts given by the Customizer. When you've finished making your changes, you are prompted to put a disk into the drive. After inserting the disk, press RETURN. A new file called CUSTOM SAM & ED is written to this disk. If the disk already contains a previous version of CUSTOM SAM & ED, the old version will be scratched before the new one is written. The customizer program does not alter the original SAM & ED program file.

See program listings on page 84.

Sam bounces off of Ed to make one last basket in this high-scoring game.

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Squeeze

Stephen Shull

Quick thinking is required in this classic two-player arcade game that includes just enough added features and twists to make it an entirely new and very addictive challenge. For the Commodore 64. Two joysticks are required.

"Squeeze" is an updated version of the arcade game *Surround*. As in the original game, the object is to try to force your opponent to bump into a path before you do. New features allow you to wrap around the edges of the screen and selectively turn off the light that makes your path.

The game is written entirely in machine language, so you'll need to use the "MLX" machine language entry program found elsewhere in this issue to enter it. When MLX asks for a starting and ending address, respond with these values:

Starting address: C000
Ending address: C997

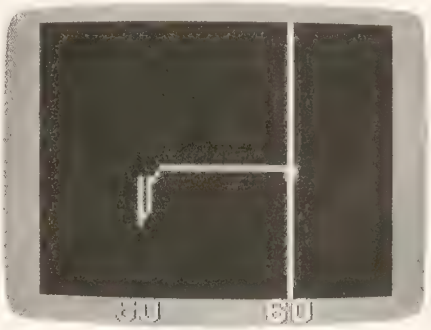
Be sure to save a copy of Squeeze to disk or tape before exiting MLX.

Playing The Game

Since this is a machine language game, load it with a command like this:

```
LOAD"SQUEEZE",8,1
```

(Tape users should use LOAD "SQUEEZE",1,1 instead.) You'll have to substitute the filename you used when you saved the program. To start the game, type SYS 50542.



Lightning bugs fly through a maze of their own trails in this unusual variation of a popular video game.

Squeeze begins with two fireflies on the screen. The player with the joystick in port 2 controls the green firefly, which begins each round on the left side of the screen. The player holding the joystick in port 1 controls the purple firefly, which begins on the right side. The game doesn't start until one of the fire buttons is pressed. All subsequent rounds begin automatically after a crash.

Both players leave a path of light—which is deadly—on the screen as they move. You score points by driving your opponent into one of these paths. The score is constantly displayed at the top of the screen. At first, the fireflies move slowly, but as the round progresses, they begin to move increasingly fast, making it more and more difficult to avoid the paths that soon fill the screen.

Squeeze includes a wrap-around feature, which means that if your firefly goes off any side of the screen, it will reappear on the screen at the opposite side. For instance, if you go off the bottom of the screen, your firefly will reappear at the top.

Another added feature allows you to selectively turn your light on and off, creating holes in the path that you make. To keep your light off as you move, hold down the fire button. Careful use of this feature will allow you to leave escape holes in your path. Keep in mind that your opponent can make use of these holes as well.

The game is over as soon as one player reaches 10 points. The screen turns red to show that the game is over. To play another game, simply press either fire button.

See program listing on page 87.

Alt-80 For The 128

Bob Kodadek

Explore the inner workings of the Commodore 128's 80-column chip with this fascinating tutorial that leads you through the development of an alternate-screen utility.

Programmers are just beginning to unravel the full power of the 8563 Video Display Controller chip (VDC), which generates the 80-column video display of the Commodore 128. Unlike the VIC-II chip, which provides the 40-column display of both the 64 and 128, the VDC has its own 16K of independent RAM and 37 internal registers. Neither the RAM nor the registers can be accessed directly. Instead, two memory locations in the 128's address space are used to communicate with the VDC.

Location 54784 ($D600) is the address register and 54785 ($D601) is the data register of the VDC. Because of a peculiarity in addressing the VDC, BASIC should not be used to change these registers. Instead, there are routines in the 128's ROM that both BASIC and machine language programmers can use. We'll demonstrate the technique by programming an alternate 80-column screen.

The two routines used to communicate with the VDC are located in bank 15 at 52684 ($CDCC) and 52698 ($CDDA) in screen editor ROM. The first routine is used to write to the VDC chip's internal registers and the second is used to read from them. When you're calling either routine, the X register should hold the number of the register that you wish to read or write, and the A register should hold the value that is written to or read from the register.

Display And Attribute Memory

The VDC's RAM is addressed in the location range $000–$3FFF. The RAM contains screen memory, attribute memory, and character definitions for the 80-column display. The default configuration for VDC RAM is as follows:

```
$0000-$07FF  Screen memory
$0800-$0FFF  Attribute memory
$2000-$3FFF  Character sets
```

Note that the area $1000–$1FFF is normally unused. This 4K space is large enough to set up a second, totally independent screen—complete with its own attribute memory. In the same format that the default screen uses, here is the layout for our alternate screen:

```
$1000-$17FF  Alternate screen memory
$1800-$1FFF  Alternate attribute memory
```

To display our new screen, we need only to write the new starting addresses of the screen and attribute RAM to the proper VDC internal registers. Registers 12 and 13 specify the start of screen RAM, while registers 20 and 21 specify the start of attribute RAM. The low byte of both addresses is always zero, since the screen editor ROM routines assume that screen and attribute memory begin on an even page boundary. Thus, only the high byte of the addresses needs to be changed.

In 80-column mode, the 128 uses locations 2606 and 2607 to store the page number of the beginning of the screen and the beginning of attribute memory, respectively. We'll have to update these pointers before the computer can display information on an alternate screen.

All the pointers can be updated with this immediate-mode line:

```
SYS 52684,16,12:SYS 52684,24,20:POKE
2606,16:POKE 2607,24
```

Type this line and press RETURN to switch instantly to the alternate screen. Clear the screen and list the directory. No matter what you do on this alternate screen, the original screen will not be affected. Type this line to go back to the original screen:

```
SYS 52684,0,12:SYS 52684,8,20:POKE
2606,0:POKE 2607,8
```

You should see the original screen just as you left it.

The demo program included with this article switches between the two screens at the press of a key. It will provide you with a good idea of how to incorporate an alternate screen into your own BASIC programs. Be sure to save a copy to tape or disk after you've entered the program.

See program listing on page 90.

Calendar Maker

William Coleman

Print custom calendars for any year from 1900 to 2050 with this suprisingly short, efficient program. Calendars can be saved to disk or printed onscreen or on paper. For the Commodore 128, 64, Plus/4, or 16.

Where would you go to find out on which day of the week Christmas falls in the year 2000? Or the day of the week on which you were born? Type in "Calendar Maker," and you need to go no farther than your computer. Calendar Maker prints out nicely formatted twelve-month calendars with a personalized message that you write.

It is a short program written entirely in BASIC. Type it in and save it to tape or disk. When you're ready to make a calendar, load and run the program.

When asked for the year of the calendar that you want to make, enter a year from 1900 to 2050. If you enter a number from 0 to 99, Calendar Maker will assume that you're asking for a year in the twentieth century and append a prefix of 19 to your entry.

The program next asks for a message to put at the top of the calendar. Type in a message, and the program will print it over and over to form the numerals of the year that you chose. Press RETURN at this prompt if you'd rather have solid numerals.

Finally, you must choose between normal and reversed mode for the year header. Nearly all Commodore and compatible printers work with normal mode, but some may have trouble with reversed mode. An example is the Commodore 1526 printer, which prints some years correctly in reverse mode but not others.

Next you'll see this line on the screen:

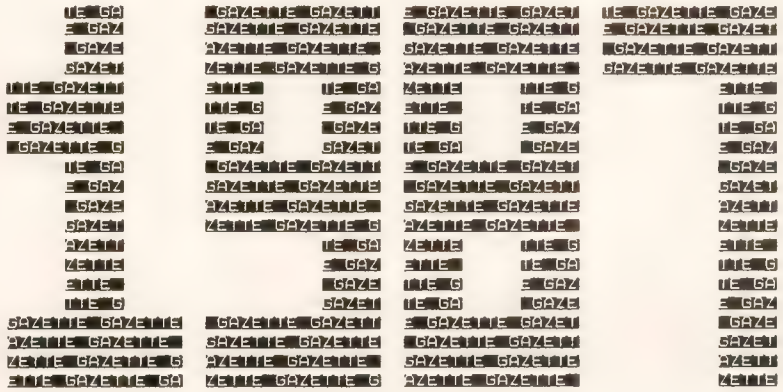
(S)creen, (P)rinter, or (D)isk?

If you choose S, the output will go to the screen. The display will be unreadable unless you're using 80 columns.

Choose P to print the calendar to your printer. This is the option that you'll be using most often. To center the calendar, move the paper about ¼-inch down from the top of the page before printing.

Choose D to if you wish to save the calendar to disk. This is useful if you wish to make several copies of the same calendar. If you use this option, you'll need to use a sequential-file-printer utility to dump the file to the printer.

See program listing on page 90.



```
      JANUARY                FEBRUARY                MARCH
SU MO TU WE TH FR SA   SU MO TU WE TH FR SA   SU MO TU WE TH FR SA
                1  2  3      1  2  3  4  5  6  7      1  2  3  4  5  6  7
 4  5  6  7  8  9 10      8  9 10 11 12 13 14      8  9 10 11 12 13 14
11 12 13 14 15 16 17     15 16 17 18 19 20 21     15 16 17 18 19 20 21
18 19 20 21 22 23 24     22 23 24 25 26 27 28     22 23 24 25 26 27 28
25 26 27 28 29 30 31                              29 30 31

      APRIL                  MAY                    JUNE
SU MO TU WE TH FR SA   SU MO TU WE TH FR SA   SU MO TU WE TH FR SA
          1  2  3  4                  1  2            1  2  3  4  5  6
 5  6  7  8  9 10 11      3  4  5  6  7  8  9      7  8  9 10 11 12 13
12 13 14 15 16 17 18     10 11 12 13 14 15 16     14 15 16 17 18 19 20
19 20 21 22 23 24 25     17 18 19 20 21 22 23     21 22 23 24 25 26 27
26 27 28 29 30           24 25 26 27 28 29 30     28 29 30
                         31

      JULY                   AUGUST                 SEPTEMBER
SU MO TU WE TH FR SA   SU MO TU WE TH FR SA   SU MO TU WE TH FR SA
          1  2  3  4                        1               1  2  3  4  5
 5  6  7  8  9 10 11      2  3  4  5  6  7  8      6  7  8  9 10 11 12
12 13 14 15 16 17 18      9 10 11 12 13 14 15     13 14 15 16 17 18 19
19 20 21 22 23 24 25     16 17 18 19 20 21 22     20 21 22 23 24 25 26
26 27 28 29 30 31        23 24 25 26 27 28 29     27 28 29 30
                         30 31

      OCTOBER                NOVEMBER               DECEMBER
SU MO TU WE TH FR SA   SU MO TU WE TH FR SA   SU MO TU WE TH FR SA
                1  2  3      1  2  3  4  5  6  7            1  2  3  4  5
 4  5  6  7  8  9 10      8  9 10 11 12 13 14      6  7  8  9 10 11 12
11 12 13 14 15 16 17     15 16 17 18 19 20 21     13 14 15 16 17 18 19
18 19 20 21 22 23 24     22 23 24 25 26 27 28     20 21 22 23 24 25 26
25 26 27 28 29 30 31     29 30                    27 28 29 30 31
```

Remedy
Crash Prevention For The 64

Robert Masters

BASIC and machine language programmers will appreciate this small utility that makes the Commodore 64 virtually crash-proof. When using this program, you'll rarely—if ever—lose work due to lockups.

One of the great attractions of the Commodore 64 is its malleability. With its ROM and I/O switches and its BASIC and Kernal vectors, the 64 can play the part of many computers. Perhaps more than any other home computer, it can be tailored to suit your needs.

The open nature of the 64 does, however, leave the programmer at the mercy of his or her mistakes. A single mistyped statement is all that is needed to paralyze the screen and render the keyboard inoperative. Often the RUN/STOP–RESTORE key combination will bring the computer back to life—but not always. Turning the computer off and back on again is a guaranteed solution to any lockup, but it also wipes the computer's memory clean—including any programs, programming aids, assemblers, and machine language monitors that you may use. Lockups can be exceedingly frustrating.

Some 64 users purchase reset switches, devices that plug into the 64's expansion port to give the computer a true reset (not the simulated reset performed by RUN/STOP–RESTORE). Commodore 128 owners have a reset button on their computers.

Whether or not you have a reset switch for your 64, you can benefit from "Remedy," the program accompanying this article.

Typing It In

Remedy is a BASIC program that creates a machine language program in memory. Type it in and save it to tape or disk. Since the data must be typed accurately, use "The Automatic Proofreader" program located elsewhere in this issue when you enter the program. Remedy is designed to be located at 49152, using 447 bytes of memory. If you'd rather have the program reside at a different memory location, change the address in line 20. To use Remedy, simply install it at the start of a programming session.

Remedy actually prevents certain kinds of crashes. But even if, in rare cases, it doesn't prevent a crash, Remedy still lets you survive most of them with your program intact.

As a bonus, Remedy keeps your favorite screen colors on the screen, even after a RUN/STOP–RESTORE. (You can set these colors in line 30.)

A Silent Guard

Most of Remedy's work is accomplished when it is first activated. After this, it waits silently for you to tell Remedy that a crash has occurred. Do this by pressing the RESTORE key. Often, this is enough to restore your work.

Some problems are so serious that they require a more drastic procedure—a cold start. Remedy has its own cold-start key combination—press the RESTORE key while holding down the back-arrow key, the 1 key, and the 2 key. Pressing these four keys has two side effects. First, Remedy is disabled. Second, any BASIC program in memory is erased. To recover Remedy and your program, type SYS 49152 (or the appropriate SYS to start Remedy, if you changed the address at which the Remedy routine resides). You'll find your program intact with its arrays, strings, and variables still valid. Printing the values of variables is a debugging tool that can sometimes help you discover the cause of the crash. If you choose *not* to recover your BASIC program, simply define any variable (for example, X = 1) before reactivating Remedy. This may be necessary if you suspect that some BASIC pointers had been corrupted before the crash.

Remedy has another feature: It lets you recover your program after

you type NEW. To bring a program back after a NEW command, type SYS 49162. (If you've changed the starting address of Remedy, add 10 to the start of Remedy to find the location of the unnew routine.)

An Acid Test

If you type in any of the following POKEs on an unprotected 64, the computer will crash. But with Remedy installed, each and every one of them can be prevented or corrected with the procedure outlined above.

POKE 1,51	Switch off I/O devices
POKE 1,53	Switch off BASIC and Kernal ROMs
POKE 115,0	Disable all commands
POKE 770,128	Disable direct-mode commands
POKE 772,121	Lock up BASIC
POKE 56322,0	Turn off keyboard

Cautions

Never press the RESTORE key while a cold start is in progress. This could cause a lockup that even Remedy can't prevent.

There is one other lockup that is beyond Remedy's powers to prevent. If the 64's microprocessor tries to execute an invalid opcode, the computer will crash completely. There is no way to prevent this and no way to recover from it. If you do have a reset button, press it and SYS to the Remedy routine for a full recovery.

Remedy is preventative medicine for your computer—an ounce of prevention that you shouldn't be without.

See program listing on page 83.

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Easy Full-Screen Animation

Paul W. Carlson

Get spectacular 3-D animations with this hi-res graphics utility for the Commodore 64 with a disk drive. Two impressive demos are included.

Producing full-screen animation is not a simple task. It's usually achieved by rapidly displaying a series of high-resolution screens on a video display. Producing realistic animation in BASIC is nearly impossible because of the time required to create the screen images.

Animation is normally done by repeating two processes over and over. First, the endpoints of a line segment are computed. Second, the line segment is displayed on the screen.

"Easy Full-Screen Animation" speeds the animation by separating these two processes. First, a BASIC program is used to generate the endpoints for each and every screen. This takes a considerable amount of time, but it needs to be done only once. The animation can then proceed at maximum speed. A machine language routine is used to draw the lines that connect the endpoints.

Typing It In

Program 1, written in BASIC, is a short loader program that configures the computer for the machine language animation routine. Type it in and save it to disk. Since it tries to load files from the disk (files which you have not yet created), do not attempt to run the program yet.

Program 2 is the high-speed line drawing routine. Because it is written entirely in machine language, you must enter it using the "MLX" machine language entry program found elsewhere in this issue. When you run MLX, you'll be asked for the starting and ending addresses for the data you'll be entering. For Program 2, respond with the following values:

Starting address: C000
Ending address: C37F

When you've finished typing in the data, be sure to save a copy to disk before leaving MLX. Be sure to save the data on the same disk with Program 1. Also, be sure to use the filename ANIMATOR for the Program 2 data, since that is the name the loader program looks for. (See line 50 of Program 1.)

The word LOVE being rotated in three dimensions.

A Demonstration Skeleton

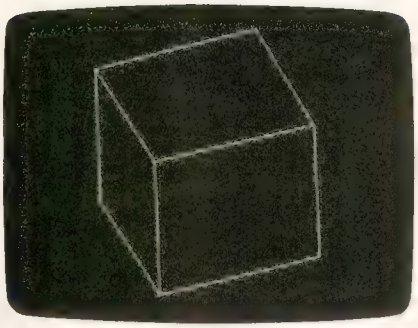
The final step is to write a BASIC program that creates a data file which can be read by Program 2. Two such programs are included. The first, Program 3, shows the word *LOVE* rotating in space. The second, Program 4, is a three-dimensional cube that approaches the viewer as it rotates.

Programs 3 and 4 (and any other programs that you write to create animated graphics data) share a significant number of program lines, so you can save yourself some time by typing in the common lines only and saving them to a file called SKELETON. Then, when you want to enter a data file creator, simply load SKELETON and type in the rest of the lines needed to make the full program. You can take the lines from either Program 3 or Program 4. The common lines are 10 and 400–550.

Type in Programs 3 and 4, and save them on the disk with Program 1 and 2. Programs 3 and 4 create the data files for the animator program. Run the programs to create the animation data files. After you run either program, you will be asked for a filename for the data file to be created on the disk. I suggest using LOVE.DATA when running Program 3, and CUBE.DATA when running Program 4. You can use any name you want for the animation data files, but be sure you don't use the name of an existing file. It takes some time to generate all the points and write the data to disk. Do not stop the program prematurely. Be sure to use the same disk that contains Programs 1 and 2.

Animating The Data

After you've created animation data files, load and run Program 1. The program asks you what screen colors you would like. Respond with your favorite combination. The program asks what file you would like displayed. Respond with *LOVE.DATA* or *CUBE.DATA* (assuming you used the suggested filenames). Remember to supply the name of the animation data file itself, *not* the name of the BASIC program that created the animation



This is only one frame of an animated "movie" in which a constantly rotating box repeatedly approaches the viewer and then retreats.

data. You'll see smooth, fast full-screen animation. Press any key to break out of the animation.

Your Own Art

Creating your own animation data file requires knowledge of BASIC. Three-dimensional rotation requires knowledge of trigonometry and geometry, but it's relatively easy to program two-dimensional animation. Follow these steps to create your own animation files:

- Load the template file SKELETON which contains lines 10 and 400–500.
- All DIM statements and variable initialization should be done after line 10 and before line 400.
- The variable NS should be assigned a value equal to the number of screens to be displayed. This assignment must be located between lines 10 and 400.
- The subroutine that handles the computations for each screen must begin at line 1000. For each line segment, the program must compute the endpoints for the line, store them in the variables X1, Y1, X2, and Y2, and then execute the statement GOSUB 500.

Use the two demonstration programs, Programs 3 and 4, as a guideline when making your own animation file generators. As a first exercise you might want to change the data in Program 3 to draw your initials or another short word. The lines that make up the letters are expressed as cartesian coordinates. Graph paper is helpful when designing your animations.

The maximum number of line segments allowed in the file is 1920.

See program listings on page 82.

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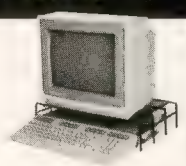

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128 Graph Designer

Danny Komaromi

Create professional-looking graphs and charts and display them with a slide-show option. A disk drive is required.

Pie charts show the size of the parts in relation to the whole. Bar charts allow quick comparison in examining fluctuations. Line graphs show trends. All three types of graphs are extremely useful in various kinds of analysis—and all three can be made quickly and displayed easily with "128 Graph Designer."

Designing

Graph Designer is written entirely in BASIC 7.0. Type it in and be sure to save a copy to disk before running it.

To get started, load the program and type RUN. Graph Designer asks whether you would like to design graphs or display previously generated graphs with the slide-show option. For now, choose 1—Graph Designer. After a 50-second pause, you'll see the graph menu. Use the space bar to select either pie charts, bar charts, or line graphs. Press RETURN when the arrow points to the type of graph you wish to make.

Let's step through all three types of graphs.

Pie Charts

When you want to show how various proportions are related, the pie chart is a good solution. For example, suppose we had this data on computer sales at a local computer store:

Mom & Pop's Computer Store Sales

Home computers	**$30,000**
School computers	**$12,000**
Business computers	**$46,500**

The numbers are straightforward, but a pie chart would better show how important each market is to this particular store.

The program first asks for a filename to use when it stores the finished graph. Enter a filename that does not exist on your disk.

The program next asks for the number of items. Enter 3. Next, choose a color for the pie chart.

The computer asks for the title of the graph. Enter *Mom & Pop's Sales.* Next enter the three categories (one per line): *HOME, SCHOOL, BUS.* Finally, enter the values: *30000, 12000, 46500.*

The program draws a pie chart one section at a time. After it draws each slice, use the cursor keys to place the legend (description) wherever you like. If you use short phrases as legends, you should be able to fit most of the legends entirely within slices of the pie. Press the P key when you're satisfied with the placement of the legend.

After the entire pie has been drawn and all of the legends have been placed where you like, press the S key to save the chart to disk. If you'd like to make modifications, press the ← (back-arrow) key to start again from the beginning.

Bar Charts and Line Charts

From the menu, select the bar chart option. Follow the prompts to enter your data. The bar chart option works much like the pie option, except that you choose a color for each bar. For bar charts, the program automatically places your labels below the bars—no special positioning is necessary. When the graph has been drawn, press the S key to save the chart.

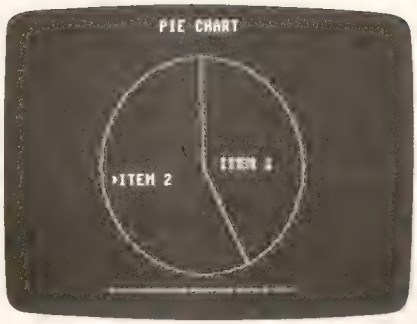
The line graph option works almost exactly like the bar chart option, except that you choose one color for the entire graph. Follow the prompts. After the graph has been drawn, press the S key to save it.

Showing Off

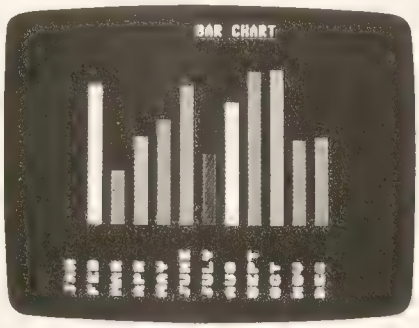
Once you've generated all the graphs and charts that you need, you can display them with Graph Designer's slide-show option (named Graph Show in the program). If you're currently in the graph design portion of the program, press RUN/STOP–RESTORE to exit it. Run Graph Designer and choose option 2. Graph Show expects all the graphs to be on the same disk. Insert the disk with the graphs into the disk drive.

To insure that you know the names of all the graphs, choose option 2 on this menu for a disk directory. Write down the names of the graphs if there are too many for you to remember.

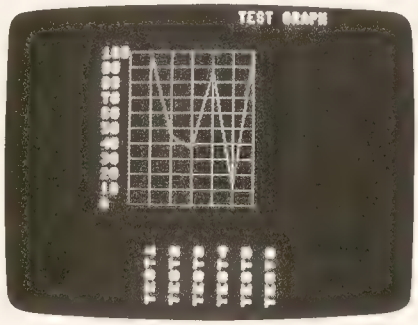
Next, set the order of display with option 1. It will ask for the



Pie charts are one of the three types of graphs that "128 Graph Designer" can create. Here, the cursor keys are being used to place the label ITEM 2.



Colorful bar charts can be used to show trends. Up to 15 bars can be displayed.



Line graphs connect points, making it easy to spot sharp changes in the data.

filenames of all the charts you would like to display. Any hi-res screen will do—you can use a paint program to modify the graphs you have already created or create other pictures for the show.

As a final step before displaying the images, use option 3 to select the length of time that each picture will be displayed.

Show your graphs with option 4. When the last graph has been shown, the program will start over with the first. During the show, you can press the space bar to temporarily freeze the display. The pause will begin after the next graph is loaded. Press space again to continue the show.

See program listing on page 88.

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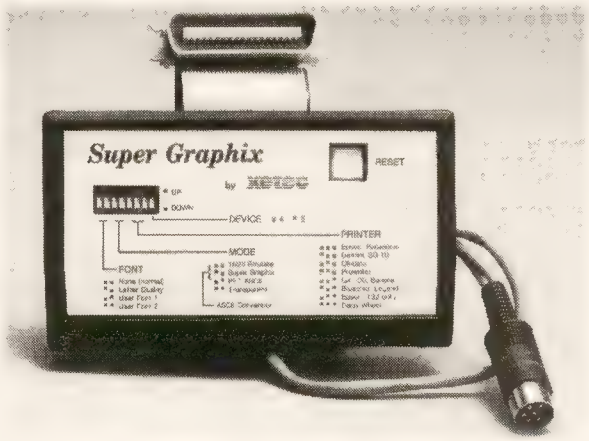

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The Power Of *Submit* For CP/M

James Adams

If you've begun to explore the world of CP/M on your Commodore 128, it's important that you know the power of submit, *which can make working with files much faster and easier. Included are samples that show you how to customize your system quickly and easily.*

SUBMIT.COM is a powerful and useful utility included on the CP/M system disk bundled with the Commodore 128. It's easy to use, and it can automatically execute a series of commands to run an entire sequence of programs, often without any input from the user.

CP/M *submit* files with the .SUB extension are similar to batch files with the .BAT extension so familiar to IBM PC users. (Incidentally, batch files are used in MS-DOS—the operating system of the IBM PC—which is based to some degree on the older CP/M operating system.) Any filename may be used, but the file extension must be .SUB.

You may use any word processing program or line editor to create a submit file. VDE and its predecessor, VDO, are simple CP/M word processors available in the public domain. I use VDE to create .SUB files. ED, the line editor included on your CP/M system disk, will also do the trick. Commercial word processing programs such as *WordStar* work well if you select nondocument mode.

As you use your text editor to enter and edit your .SUB file, type each line exactly as you would if you were entering each one individually at a system prompt. End each line with a carriage return.

To execute your new .SUB file, simply type:

SUBMIT *filename*

If the .SUB file is not on the logged drive, you must specify the drive (for example: A>B:SUBMIT GAMES). In addition to the .SUB file, all the programs which are to be executed must also be on the logged drive (or the drive should be specified within the .SUB file).

Let's take a look at some examples of useful .SUB files and how they work.

PROFILE.SUB

The file PROFILE.SUB is a special file which your computer looks for when entering CP/M mode. PROFILE.SUB is to CP/M what AUTOEXEC.BAT is to IBM PC.

A PROFILE.SUB file might contain the following lines:

```
↑[↑[↑[U
SCREEN40 OFF
DATE SET
```

To execute this .SUB file, the disk must contain CPM+.SYS, CCP .COM, SUBMIT.COM, SCREEN40 .COM, and DATE.COM.

The first line changes the cursor color to green on a black background. The second line disables the 40-column screen to increase the speed of the CP/M operating system. You should use this line only if you have an 80-column monitor.

The third line would be useful if you use CP/M's time and date stamping capability on your disks. This line causes the computer to ask you to enter the current date (MM/DD/YY) and time (HH:MM:SS). The 128's internal clock will then place the appropriate time and date stamps on the disk directory each time you access a file.

I have a different PROFILE.SUB file on each of my main applications disks. If I'm going to be using a word processing program such as VDE, my PROFILE.SUB file contains an additional line which specifies the name of the particular applications program. All I have to do is turn on the computer with the disk in Drive A:, and, after the commands in the PROFILE.SUB file have been executed, VDE (or other program) is waiting for me. If you later want to switch to a different application disk, insert the appropriate disk into the drive and press CONTROL-ENTER. (You must use the ENTER key on the numeric keyboard.) This causes CP/M to reboot and execute the PROFILE.SUB program on the disk.

If I plan to do some telecomputing, I simply insert the disk containing the necessary files plus

MEXJKA.COM. MEX.COM is a public domain telecommunications program which can be modified with the particular features, telephone numbers, and passwords the user needs. MEXJKA is my personalized version. When I turn on my 128 with the disk in drive A: and the computer is finished running the PROFULE.SUB file, MEXJKA is ready for dialing. I could even have the PROFILE.SUB file specify a number for MEXJKA to dial. The connection would then be made automatically.

BAKDEL.SUB

After several sessions with a word processing program, your disk begins to fill up with BACKUP (.BAK) files. I periodically delete these files, so I developed the SUBMIT file BAKDEL.SUB to automate the process.

The file looks like this:

```
TYPE MESSAGE.ONE
DIR B:*.BAK [Full]
ERASE B:*.BAK
TYPE MESSAGE.TWO
```

To execute, the disk containing the .SUB file will be in Drive A: and must contain the files SUBMIT-.COM, DIR.COM, ERASE.COM, MESSAGE.ONE, and MESSAGE .TWO. The disk to be purged of .BAK files is in drive B:.

Line 1 is optional. MESSAGE .ONE is a text file I created which contains 20 blank lines plus the line *BAKDEL will erase the following files:*. This forces information on the screen to be scrolled away and prints the message line near the bottom of the screen. The second line of the .SUB file calls the DIR program and lists all the files on the disk in drive B: with the .BAK extension. Time and date information is also listed. This line lets you look over the files before you make any decisions. The third line does the real work. ERASE will list each file with the .BAK extension and prompt you for a *Y* or an *N*. The last line is also optional. MESSAGE .TWO is another text file I created. It contains 20 blank lines plus the line *Returning to operating system.*

DISKBAKB.SUB

Perhaps the first rule of computing is to always make backup copies of your work. To make this easier, I created a .SUB file called DISKBAKB.SUB. This file formats a disk, sets up the directory for time and date stamping, specifies what information will be placed in the stamping area, calls the program NSWP .COM, and issues the first command.

The final B of DISKBAKB is a reminder that the .SUB file must be in drive B:. There is no alternative to this since FORMAT.COM (line 1) specifies that the disk to be formatted be placed in drive A:.

The file contains these lines:

```
FORMAT
INITDIR A:
<Y
SET A:[NAME=$1.BAK,ACCESS=ON,
  UPDATE=ON]
NSWP
<LE:
```

The disk containing this .SUB file must contain SUBMIT.COM, FORMAT.COM, INITDIR.COM, SET.COM, and NSWP.COM.

Line 1 calls the program FORMAT (included on your CP/M system disk). You will have to answer three prompts within the program to specify the type of format you wish (probably 128 double-sided), to confirm that you do indeed wish to FORMAT the disk and to tell the program that you have no other disks to FORMAT.

Line 2 calls up the program INITDIR to act on the newly formatted disk in drive A:. Line 3 automatically answers the question *Do you want to reformat the directory on Drive A:?*. The < is used within a .SUB file to indicate information which will be used as input within the program. If no input is specified in the .SUB file, the program will stop execution until you give an appropriate response. If more input is specified in the .SUB than the program needs, a warning message will be displayed and the extra lines will be ignored.

Let's back up for a moment. Earlier, I said that all you had to do to use a .SUB file was to type SUBMIT *filename* at the A> prompt. The SUBMIT command also allows you to specify parameters which are passed on to the programs called by the .SUB file. The format is:

SUBMIT ***filename $1 $2 and so on***

In our example we could type:

```
SUBMIT DISKBAKB READY
```

The computer would then translate line 4 as:

```
SET A:[NAME=READY.BAK,ACCESS=
  ON,UPDATE=ON]
```

The $1 has been replaced with the name READY, which was specified in calling the original SUBMIT file. Up to nine parameters may be specified ($1 to $9). $0 is a special case—it holds the name of the SUBMIT file that is being called.

SET.COM is a powerful command with many attributes. In this example, in addition to giving the disk a label (NAME), I've also specified that the ACCESS or UPDATE portion of the directory be stamped at each disk access. PASSWORD protection, READ and WRITE protection, ARCHIVE information, and user-definable file attributes can all be controlled with the SET command.

In my DISKBAKB.SUB file I have the public domain program NSWP (NEW SWEEP) specified in line 5. This is a directory management utility which comes in several versions. This program does the actual copying for the backup. There are a number of similar programs that could be used (including PIP which is on the CP/M system disk).

Line 6 issues the command to NSWP to change the *logged* disk drive to E:. This is the CP/M+ virtual disk drive. The computer will prompt me to replace the disk in drive A: (the backup disk) with the disk to be backed up. Again, several methods could be used to suit your own needs.

Submit With A RAMdisk

If you have a 1700 or 1750 RAM Expansion Module for your 128, you might wish to have your PROFILE.SUB file copy all the files and utilities that you will need onto the M: disk (memory disk). This will speed CP/M up tremendously.

In the world of CP/M, SUBMIT.COM can be a real timesaver and can make routine tasks a little easier.

GEOS File Storage Format

Douglas S. Curtis

Explore the internal structure of GEOS *files and see how to make your own* GEOS *utilities. A sample utility that prints out information from Notepad is included. For the Commodore 64 with* GEOS.

GEOS, the *Graphics Environment Operating System* for the Commodore 64, is more than just a program to provide menus and icons. As its name suggests, *GEOS* is a completely new operating system that makes some very fundamental changes in the way the 64 behaves. One of the most significant features of *GEOS* is that it provides new formats for storing information on disk. If you have a basic understanding of how the 64's current disk filing system works, this article will explain how *GEOS* builds on that system to provide its more powerful, and more complex, file structures.

GEOS Directory Format

Like the 64's standard operating system, *GEOS* requires a disk directory structure to record what's where on the disk. The *GEOS* directory structure is similar to the standard system. Track 18 on the disk is still the directory track, and sector 0 of that track is the block availabiltiy map, or BAM. The BAM records which sectors (also called blocks) are currently filled. The remaining sectors of track 18 contain directory entries—eight 32-byte entries per directory block. Each file on the disk must have a directory entry.

A *GEOS* directory entry contains much more information than a standard 64 directory entry. However, there are some similarities. Look at Figure 1. For the first file in each directory block, bytes 0–1 contain either the track and sector of the next directory block or $00 $FF to mark the end of directory blocks. For the remaining entries in the directory block, bytes 0–1 are always zeros.

Byte 2 of the entry holds the first byte of the file descriptor, explained below. The next two bytes (3–4) hold the track and sector of the first block of the file. The next 16 bytes (5–20/$05–$14) are for the filename. So far, the directory entry is the same as for the standard Commodore operating system However, in the standard system, bytes 21–29 of the entry are either unused or used only for relative files. *GEOS* puts these bytes to special uses.

Bytes 21–22/$15–$16 hold the track and sector of the file's information/icon block, also called the file header block. This block is where the data for the file's icon is stored, along with file descriptors, addresses, and comments. Icon/information blocks are explained below.

Bytes 23–24/$17–18 of the directory entry are the remaining two bytes of the file descriptor. The following five bytes (25–29/$19–$1D) contain the file's date and time stamp, in this order: year minus 1900, month, day, hour, minute. The last two bytes of each entry are the total number of blocks used for the file (including data, index table, and information/icon blocks).

File Descriptors

GEOS file descriptors are used both in directory entries and in information/icon blocks. The descriptor values for the most common file types are listed in the following table:

File Type	Descriptor
BASIC program	$82 $00 $01
Machine language	$82 $00 $02
System file	$83 $01 $04
Desk accessory	$83 $00 $05
Application file	$83 $01 $06
Application data	$83 $01 $07
Font file	$83 $01 $08
Printer driver	$83 $00 $09
Input device driver	$83 $00 $0A

The first byte indicates the Commodore file type for the file. Note that most types use the value $83, so most *GEOS* files appear in a standard directory listing as USR files. Bit 6 of this byte is used to indicate the write-protection status of the file. When this bit is 0, the file is unprotected. Setting the bit to 1 protects the file from accidental erasure. When the bit is set to 1, the first digit of the value will change from 8 to C. (See Figure 1, where all the files in the directory block are write-protected.) The remaining two bytes define the *GEOS* file type. The first indicates whether the file is in sequential (00) or VLIR (01) format. These formats are explained later in this article. The final number (01–0A) specifies the file type.

Information/Icon Block Format

As mentioned above, the directory entry for each *GEOS* file contains a pointer to an information/icon block. The information/icon block (see Figure 2) is unique to the *GEOS* file storage system. The block is created when a *GEOS* file is created, and is usually altered only by adding comments. (It is possible, however, to edit the the icon data in the block; see "Icon Changer For *GEOS*"

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Figure 1: *GEOS* **Directory Structure**

```
00 :12 09 C2 01 08 47 45 4F 53 A0 A0 A0 A0 A0 A0 A0 :  ç  GEOS
10 :A0 A0 A0 A0 A0 00 00 00 00 00 00 00 00 00 01 00 :
20 :00 00 C2 01 11 47 45 4F 53 20 42 4F 4F 54 A0 A0 :  ç  GEOS BOOT
30 :A0 A0 A0 A0 A0 01 09 00 02 56 04 07 0C 00 06 00 :     V
40 :00 00 C3 01 12 47 45 4F 53 20 4B 45 52 4E 41 4C :  £  GEOS KERNAL
50 :A0 A0 A0 A0 A0 01 0A 01 04 56 04 07 0C 00 55 00 :     V     U
60 :00 00 C3 05 08 44 45 53 4B 20 54 4F 50 A0 A0 A0 :  £  DESK TOP
70 :A0 A0 A0 A0 A0 05 00 01 04 56 04 07 0C 00 48 00 :     V     H
80 :00 00 C3 08 13 47 45 4F 50 41 49 4E 54 A0 A0 A0 :  £  GEOPAINT
90 :A0 A0 A0 A0 A0 08 0B 01 06 56 04 07 0C 00 77 00 :     V     w
A0 :00 00 C3 09 0E 47 45 4F 57 52 49 54 45 A0 A0 A0 :  £  GEOWRITE
B0 :A0 A0 A0 A0 A0 08 06 01 06 56 04 07 0C 00 58 00 :     V     X
C0 :00 00 C2 13 00 42 41 43 4B 55 50 A0 A0 A0 A0 A0 :  ç  BACKUP
D0 :A0 A0 A0 A0 A0 13 0B 00 01 56 04 07 0C 00 10 00 :     V
E0 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
F0 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
```

Figure 2: The Information/Icon Block

```
    00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

00 :00 FF 03 15 BF FF FF FF 80 00 01 81 FF FD 81 FF
     EOF              ^ Start of ICON DATA >
10 :FD 81 FF FD 80 00 39 BF FF BD BF FF BD BF FF BD

20 :BF 1F 7D BE EF BD BE EF BD BF 1F BD BF FF BD BF

30 :FF BD BF BF 81 BF BF 81 BF BF 81 BF FF 81 80 00
                                                End of
40 :01 FF FF FF 82 01 00 FF 07 F6 15 00 00 47 45 4F
    ICON DATA ^ Filetype  BA**  EA**  SA**  Start
50 :53 20 42 41 43 4B 55 50 20 56 31 2E 31 00 00 00
    of File Permanent name
60 :00 44 6F 75 67 20 46 75 6C 74 73 00 00 00 00 00
       ^ Author name >
70 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

80 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

90 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

A0 :42 41 43 4B 55 50 20 69 73 20 61 20 66 61 73 74
    ^ Start of comments section - - - - - - - - - - >
B0 :20 64 69 73 6B 20 62 61 63 6B 75 70 2F 72 65 72
    - - - - - - - - - - - - - - - - - - - - - - - - >
C0 :74 6F 72 65 20 75 74 69 6C 69 74 79 20 77 68 69
    - - - - - - - - - - - - - - - - - - - - - - - - >
D0 :63 68 20 63 61 6E 20 62 65 20 72 75 6E 20 66 72
    - - - - - - - - - - - - - - - - - - - - - - - - >
E0 :6F 6D 20 42 41 53 49 43 2E 00 A9 05 85 10 A9 08
    up to EOF marker              ^ the rest of the
F0 :85 11 A9 00 85 17 85 16 20 3B C2 8A F0 01 60 A9
    block is available - this example ends at $E9


** BA - Beginning Load Address minus 2
** EA - End Load Address plus 1
** SA - Start (run) Address
```

in the January 1987 GAZETTE.)

Bytes 0–1 are always $00 $FF, to indicate that the information/icon block consists of a single sector. Bytes 2–4 are always $03 $15 $BF. These bytes define the width and height of the icon and the length of the icon data. The next 63 bytes in the block (5–67/$05–$43) contain the icon data. The icon pattern data is in the same format as a standard sprite definition pattern.

The next three bytes (68–70/$44–$46) contain the file descriptor data. The last two bytes of the descriptor ($69–70/$45–$46) are reversed from the values shown in the table above. That is, the *GEOS* type value comes before the *GEOS* format value.

Bytes 71–72/$47–$48 contain the starting address (in low-byte/high-byte order) of the file associated with the information/icon block. Bytes 73–74/$49–$4A are the address plus one (in low-byte/high-byte order) of the end of the associated file. The next two bytes, 75–76/$4B–$4C, hold the file's execution address (again, in low-byte/high-byte order). If the file is an executable type—BASIC, machine language, application, or desk accessory—this address will be called to start the file after it is loaded.

Finally, bytes 77–255/$4D–$FF are the file information area. This is where the file's permanent name (class), author name, and comments are stored.

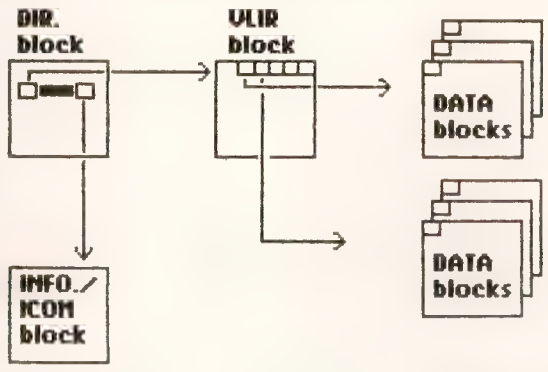
GEOS File Formats

GEOS uses two different file formats: Sequential and Variable Length Indexed Record (VLIR). *GEOS* can also use modified 64 program files, but these are not true *GEOS* files. All *GEOS* application files, application data files, and fonts are stored in VLIR files. The only sequential files on the *GEOS* system disk are the printer drivers, input drivers, and photo scraps.

GEOS sequential files should not be confused with standard Commodore sequential (SEQ) files, although the format is very similar. In a *GEOS* sequential file, bytes 3–4 of the directory entry for the file point to the track and sector of the first data block for the file. The first two bytes in the 256-byte data block are a pointer to the next data block in the chain of sectors that make up the file, and the remaining 254 bytes contain file data. The chain can consist of any number of sectors. In the last sector of the chain, the first byte is $00, and the second byte contains the offset to the the last byte of valid data in the sector.

VLIR files are quite different from sequential files. For a VLIR file, bytes 3–4 of the file's directory entry do not point to the first block of the file. Instead, the bytes point to a special one-block file called the *index table*. Bytes 0–1 of the index table block are always $00 $FF to indicate that the table consists of a single sector. The remaining 254 bytes are

Figure 3: *GEOS* VLIR File Structure



used for 127 two-byte pointers. Each pointer contains the starting track and sector of one *record* of the file. (See Figure 3.) Each record of a VLIR file is a linked chain of sectors, similar to a sequential file. Thus, a single VLIR file is like a collection of sequential files.

It's obvious from this structure that VLIR files are extremely flexible. A VLIR file can grow to almost any size. Each of the 127 possible records can be a chain up to 127 sectors long (although there isn't enough room on a disk for every record to grow that long). Moreover, it's much easier to access information in the middle of a VLIR file. With a sequential file, you have to start at the beginning and read through to the desired point. With a VLIR file, you can jump directly to the desired record.

Beware the Validate, My Son

Because of the elaborate structure of a *GEOS* disk, with VLIR index tables and information/icon blocks, it is very important that you never use the standard Validate function of Commodore DOS (OPEN 1,8,15, "V0:") on a *GEOS* disk. Validate would trace only to the index table blocks of VLIR files, and to not any of the records. And it would miss the information/icon blocks altogether, marking them as free blocks. The *GEOS* desktop provides a special validate function that you can use if you suspect problems on a *GEOS* disk.

Creating A Notepad Printer

Once you've learned about the storage formats of *GEOS* files, you can develop *GEOS* utilities in either BASIC or machine language. Let's step through a sample utility that prints the pages of the Notepad.

The Notepad desk accessory is similar to a word processor, but it offers only limited editing features and manipulates text in *pages* rather than in full documents. Thus, as its name implies, it is most suitable for creating short notes. The Notepad stores text in a VLIR file, but it imposes one special restriction. Each record in the Notepad VLIR text file is only one block long. Thus, there is a limit of 254 characters per page, and a maximum of 127 pages.

Type the program in and save it to a *GEOS* work disk. Then, boot up with *GEOS* and open the program. It searches the disk for a file named Notes. (This is the name Notepad uses for its text file.) If the Notes file is found, the program reads the VLIR index table block. This contains track and sector pointers to each page of Notepad text. The program then displays the number of pages in the Notes file and gives you the option of printing out the entire file or just a single page. After you choose which option you want, the program uses the track and sector pointer to read the block containing the specified page. If you specified the option to print the entire file, the program starts with the first page. The data from the block is sent to the printer, along with the page number. If you selected the entire file option, the program then loops back to read the next page block. Otherwise, you're given the option of printing another single page. When you're finished, you can insert your *GEOS* boot disk in the drive and hit the RESTORE key to reboot *GEOS*.

See program listing on page 91.

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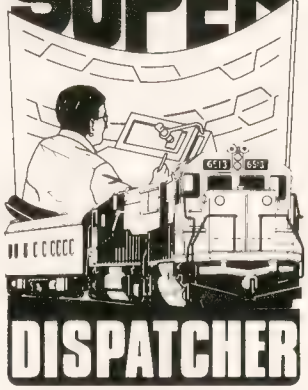
SUPER DISPATCHER



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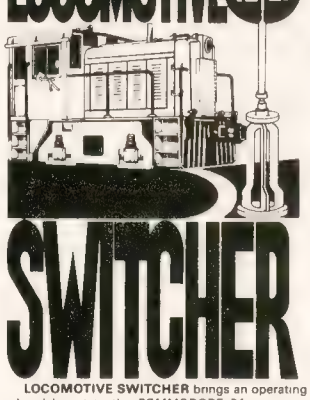
LOCOMOTIVE 42 27 SWITCHER



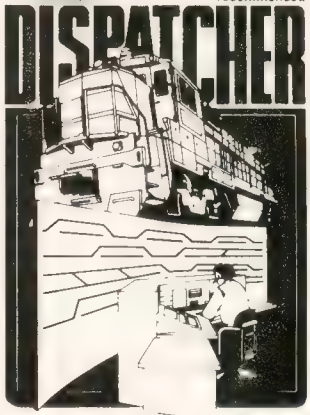
LOCOMOTIVE SWITCHER brings an operating railroad layout to the COMMODORE 64 computer screen The microlayout consists of mainline, six switches and seven loading areas Sophisticated car-motion logic simulates train movements to a degree not possible on "real" model railroad layouts

LOCOMOTIVE SWITCHER operates in two modes. As a FLAT YARD cars must be "spotted" at assigned loading docks – or pulled out to the mainline. In HUMP YARD mode the layout becomes a mini-classification yard. Operator performance is tracked and scored based on number of cars spotted, train moves, car damage and operating time

For COMMODORE 64 and 128 (disk only) at $30 00. Manual and keyboard template included

TRAIN DISPATCHER

Color TV or Monitor recommended



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Hi-Res Graphics On The 128

Part 2

Rob Kennedy

In the concluding installment of this two-part series, the author introduces several more BASIC 7.0 commands for manipulating the hi-res screen. In addition to the examples in the text, three demo programs are included.

Last month, we learned how to draw various shapes with the graphics commands of BASIC 7.0. This month, we'll conclude by looking at a few more commands. Three demo programs are included. When you've finished reading this article, type them in and try them out—you'll be suprised at how easy it is to use hi-res graphics on the 128.

Even with all the new graphics commands of BASIC 7.0, it can take a long time to draw a complex shape. To solve this problem, two commands were included. The first command, SSHAPE (for Save SHAPE), saves a portion of the screen to a string. The second, a complementary command, GSHAPE (for Get SHAPE) copies a string to the screen. These commands allow you to copy an arbitrary shape anywhere on the screen. Limited animation is possible using this procedure.

Here's the syntax for the commands:

SSHAPE *string variable, X1, Y1, X2, Y2*
GSHAPE *string, X, Y, mode*

The parameters shown in **boldface** must always be supplied. Those in the regular typeface are optional—the command works with or without them.

When you save a shape, you must set the *X1* and *Y1* parameters to the top left corner of your shape. The *X2* and *Y2* values specify the bottom right corner. If you leave out *X2* and *Y2*, the command will use the current position of the pixel cursor. The pixel cursor is similar to the cursor in text mode; it's the point on the screen where the most recent previous drawing command ended. It is the size of one pixel, and it does not flash. Since strings are limited to 255 characters, you must be careful to avoid grabbing a piece larger than a string can hold.

When you restore a shape to the screen with GSHAPE, you can specify where to place it by using the *X* and *Y* parameters. (The coordinates specify where the upper left corner of the shape will be positioned.) If you don't specify *X* and *Y* values, the shape will be placed at the current pixel cursor position. There are five available modes:

0 restore the shape as it was saved (default)
1 invert the shape
2 OR the shape with the foreground
3 AND the shape with the foreground
4 XOR the shape with the foreground

These modes are all useful in different situations. Try all of them to see the effects that they create. XOR is often used to animate objects, since it is nondestructive—a shape can be moved along without destroying the background.

Here's a short demonstration program that illustrates the use of SSHAPE and GSHAPE:

```
10 GRAPHIC1,1:COLOR0,1:COLO
   R4,1:COLOR1,2
20 X=1:Y=1:X2=10:Y2=10
40 BOX1,X,Y,X2,Y2
50 CIRCLE1,X+5,5,3
60 PAINT1,X+3,5
70 SSHAPEA$,1,1,10,10
80 GRAPHIC1,1
90 X=INT((RND(1)*300)+1)
100 Y=INT((RND(1)*190)+1)
110 GSHAPEA$,X,Y
120 T=T+1:IFT=11THENEND:ELS
    E90
```

Saving Pictures

Once you've spent the time to draw a detailed hi-res picture, you'll probably be sorry to turn off your computer and let it go. The BSAVE command can save your screen to disk. Here's a line you can use to save the entire screen to disk:

```
BSAVE"HI-RES",D0,U8,B0,P7168 TO
  P16383
```

This line saves the picture in bank 0 memory locations 7168–16383 to drive 0, device 8 with the filename HI-RES.

The following line reloads the picture from disk to the screen:

```
BLOAD"HI-RES",B0
```

Where Am I?

BASIC 7.0 has two functions that give you certain information about the computer's status. The first, RGR, tells you which graphics mode the computer is currently using. Call it like this:

var=**RGR(0)**

After this line is executed, the variable *var* will hold a number from 0 to 5 which indicates the currently active graphics mode.

The other function is RDOT. This function tells you the current location of the pixel cursor and the current color source. It looks like this:

var=**RDOT(***mode***)**

The *mode* parameter can range from 0 to 2—0 causes the function to return the X position; 1 gives the Y position; and 2 gives the color source. For example, to find the color source, use this statement:

CS=RDOT(2)

Moving The Pixel Cursor

The final command we need to learn is LOCATE. This command allows you to move the pixel cursor without drawing anything. Here is the syntax:

LOCATE *X, Y*

LOCATE is useful because the drawing commands allow you to move relative to the current cursor position by placing a + or − in front of the number. Consider this line:

CIRCLE 1,+5,+30,10,10

If a previous LOCATE set the pixel cursor to 25,25, the circle would be drawn at 25 + 5,25 + 30, or 30,55. Besides the CIRCLE command, the DRAW and BOX commands also support relative drawing.

A Final Hint

The 128 includes FAST mode. The 40-column screen will blank as long as FAST is selected. SLOW is used to turn the screen back on. If your screen setup takes a long time, you can shorten the time needed by using FAST during the drawing. When SLOW is executed, the screen is displayed. Since some people panic when the screen blanks, it's a good idea to tell the user what is about to happen.

See program listings on page 90.

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Putting It All Together

Larry Cotton

Over the last several months, we've learned enough BASIC to write useful programs. We'll write one from scratch this month. I'll illustrate the use of several of the BASIC commands that we've covered in this series. In the process, we'll learn a few more programming tricks.

The BASIC language makes it easy to program quizzes, so let's write a program that will be a quiz of state capitals.

Before beginning any program, you should first identify the main objectives. In this case, there are three: printing questions on the screen, getting the answers from the user of the program, and checking them for correctness.

Enhancements could include printing remarks appropriate to the responses to the questions and giving the score at the end of the drill.

In February's column, we illustrated how to use INPUT to ask questions and IF-THEN to check answers. Because those are two of the main objectives mentioned above, they are the main BASIC statements we'll use. Let's begin.

Setting The Stage

Let's first consider the appearance of the program: the colors, line spacing, and so on.

We need to start with a clean slate, so use this line:

```
100 PRINT"{CLR}"
```

Let's keep the screen slatelike with a dark gray border and background with white printing. Continue with this line for the Commodore 64:

```
110 POKE 53280,11:POKE 53281,11:
    PRINT"{WHT}"
```

For the 128, use the following instead:

```
110 COLOR 0,12:COLOR 4,12:PRINT
    "{WHT}"
```

The Plus/4 and 16 don't have a dark gray color. If you have one of those models, substitute this line to set up a black border and background:

```
110 COLOR 0,1:COLOR 4,1:PRINT
    "{WHT}"
```

Next, move the cursor down a bit with this line:

```
120 PRINT:PRINT
```

We'll make only one question and answer appear on the screen at a time, separated by one blank line. Simple responses such as *Very good!* for correct answers and *Sorry, that's not correct* for wrong ones will do. We'll give the student three tries before giving the answer.

Now is a good time to decide which phrases and tasks will be repeated. Repetition invites the use of GOSUBs, constants, and variables.

Since we'll often be repeating the phrase *What is the capital of*, let's define it as the variable Q$. (A BASIC programming trick is to label constants or variables with letters that have some significance, such as Q$ for Question.)

```
130 Q$="WHAT IS THE CAPITAL OF "
```

Note the space before the last quotation mark. The answers will, of course, be names of state capitals, so let's define the variable A$ (for Answer)—which we'll use over and over—to be the name of a state capital. I live in North Carolina, so we'll start with this state. Its capital is Raleigh:

```
140 A$="RALEIGH"
```

We'll ask each question up to three times. This repetition invites the use of a FOR-NEXT loop. Since some state capitals have rather long names, such as Salt Lake City, we'll print the question on one line and leave a separate line for the user to enter the answer:

```
150 FOR I=1 TO 3:PRINT Q$;"NORTH
    CAROLINA?"
```

Input Subroutine

Next we need to write a subroutine to get the user's response. To allow him or her to escape from the barrage of questions at any time, we'll plan for just a press of the RETURN key. Let's put the subroutine far enough away from the body of the program so that we're unlikely to run into it.

```
1000 C$=" ":INPUT C$:IF C$=" " THEN
     5000
1010 RETURN
```

This makes C$ the user's answer to the question (right or wrong), and checks to see if he or she wants to quit by pressing only the RETURN key. If so, the program jumps to our end-of-program routine which we'll put at line 5000.

As we demonstrated several months ago, C$ must be set to a null string (C$=" ") at the beginning of line 1000 so the user can escape from the program any time after the first question.

Note that RETURN must be on its own line in this case. If it were on the same line as the IF-THEN statement, the program wouldn't see it when the user typed an answer—the program would stumble into the next routine with undesirable results.

Now let's write a line to call the subroutine we just wrote:

```
160 GOSUB 1000
```

Checking The Answer

So far, so good. Let's add a way to check the answer (a job for IF-THEN). We want to compare the INPUT answer (C$) with the correct answer (A$). IF the answer isn't right, THEN let the user know he's wrong (a subroutine at line 3000 will do this) and repeat the question.

```
170 IF C$<>A$ THEN GOSUB 3000:
    NEXT
```

We could have checked for the correct answer another way:

```
170 IF C$=A$ THEN ...
```

But that would require another line

to check for the wrong answer, or at least to send the program back for another try. I prefer the first way.

If the user doesn't get the answer right after three tries (three loops of a FOR-NEXT), another subroutine is called. Starting at line 4000, this subroutine will print the correct answer on the screen. After this, the program needs to go to the next question, which we'll put at line 190. Edit or retype line 170 so that it looks like this:

```
170 IF C$<>A$ THEN GOSUB 3000:
    NEXT:GOSUB 4000:GOTO 190
```

When the user types the correct answer *before* three tries, the IF-THEN statement fails (C$ does indeed equal A$). The program jumps out of the FOR-NEXT loop and goes to the next line. Since answering correctly deserves a reward, we'll write a "stroker" subroutine at line 2000. For now all we need to do is call that subroutine:

```
180 GOSUB 2000
```

We've asked the first question and provided for both correct and incorrect responses and a way to get out of the program.

The next section of the program should contain the next question-and-answer routine. This time let's use Virginia:

```
190 A$="RICHMOND"
200 FOR I=1 TO 3:PRINT Q$;
    "VIRGINIA?"
210 GOSUB 1000
220 IF C$<>A$ THEN GOSUB 3000:
    NEXT:GOSUB 4000:GOTO 5000
230 GOSUB 2000:GOTO 5000
```

Because I'm illustrating this program with only two questions, I'm calling our ending routine now (at line 5000).

Subroutine For Correct Answers

The program we've written calls several subroutines to do certain tasks. If we run the program now, we'll get an error as soon as one of these missing routines is called by the program. So let's write those subroutines now. The one that begins at line 2000 is called when the student answers correctly. Since we want to count the correct answers, this is also the perfect place to put the correct-answer counter. We'll use a numeric variable C to do this.

Every time you type RUN, all numeric variables are set to zero. Since there are zero correct answers at the beginning of the program, we don't have to initialize C. We want to increment C by one only when the user types a correct answer. Here's the subroutine:

```
2000 C=C+1:PRINT"{DOWN}VERY
     GOOD!":FOR T=1 TO 1000:
     NEXT:PRINT"{CLR}{3 DOWN}"
     :RETURN
```

This line is pretty long, so don't type in any unnecessary spaces if you're using a 64. Remember that all Commodore 64 BASIC program lines must fit on two screen lines. (For a 128 in 128 mode, lines can be up to four screen lines long.)

This increments the value of variable C by one, prints the complimentary message, allows the user to read it with a short time-delay loop, clears the screen, and moves the cursor down three times. Since this is not an IF-THEN statement, it's safe to put the RETURN on the same line. A RETURN *must* be used to exit from each subroutine.

Subroutine For Incorrect Answers

We need to provide a gentle response for incorrect answers to questions. Again, we'll include a time-delay loop for reading the message, clear the screen, and reposition the cursor.

```
3000 PRINT"{DOWN}SORRY, THAT'S
     NOT CORRECT.":FOR T=1 TO
     1000:NEXT:PRINT"{CLR}{3
     DOWN}":RETURN
```

Subroutine For Displaying Correct Answers

Now we'll write the subroutine that belongs at line 4000. This one prints the correct answer after three incorrect tries (it is called by line 170). We'll display the answer A$ until the space bar is pressed. The easiest BASIC statement to handle this chore is GET.

```
4000 PRINT"THE ANSWER IS ";A$;"."
4010 PRINT:PRINT"PRESS THE SPACE
     BAR TO GO ON
4020 GET S$:IF S$<>" " THEN 4020
4030 PRINT"{CLR}{3 DOWN}"
     :RETURN
```

Reaching The End

Finally we arrive at our program-ending routine (not a subroutine, because it isn't called with a GOSUB, and it doesn't RETURN) at line 5000. Here's where we'll print the number of correct answers. The word *CORRECT* is printed after that value, and then the program ends.

```
5000 PRINT C;"CORRECT.": END
```

Before adding more states and capitals, note these changes:

- In line 220, change the GOTO 5000 to GOTO 240.
- In line 230, remove the GOTO 5000.
- Start the next question at line 240.
- Put GOTO 5000 after GOSUB 4000 in your last answer-checking line beginning with IF C$<>A$ THEN and after the GOSUB 2000 in the following line. This insures that the program ends whether the last answer was right or not.
- Take advantage of your computer's screen editing features by copying similar lines.

Next month we'll use READ and DATA statements to make programs like this even easier to write.

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machine language for beginners

Richard Mansfield
Editorial Director

There are several ways to add the speed and efficiency of machine language (ML) to a BASIC program, but perhaps the simplest is to attach DATA statements which contain the ML program. Here's a question about this which we received recently:

Your magazine has often published programs where a series of numbers were POKEd into memory—the cassette buffer, for example. Then, a SYS to the starting address of these numbers, and something happens. I basically understand that these numbers comprise an ML routine, but what I can't understand is how you arrive at the correct numbers to put into the DATA statements. For example, PRINT "{CLR}A" clears the screen and prints the letter A *in the upper left corner, then stops. How would the numbers be constructed which would do this in machine language?*

You would first create the machine language program with an *assembler,* then use a "datamaker" program to create the DATA statements to add to a BASIC program. Let's take it step-by-step.

Pure Numbers

Let's assume that you have a BASIC program which needs to print the letter *A,* 256 times. You could try this:

```
10 PRINT"{CLR}"
20 FOR I = 1 TO 256: PRINT "A";:
   NEXT I
```

But this is too slow for your purposes; you're writing an arcade game and the computer would never challenge the player at BASIC's slow speeds. So, you load your assembler program (available from many software houses, published in magazines and books, and included as part of the Commodore 128's operating system). An assembler's job is to turn your list of ML instructions into a finished ML program (pure numbers). If you are using a sophisticated assembler, you would write something like this:

```
5  *= 866
10 LDA #147
20 JSR 65490
30 LDY #0
40 LDA #65
50 LOOP JSR 65490
60 DEY
70 BNE LOOP
80 RTS
```

The assembler would then look at this and store a series of numbers from address 866 on up in your machine's memory. (This is RAM in the cassette buffer and is fine to use on the 64, but the 128 uses this space for I/O—so your BASIC program would mangle it if there's any disk access. A safe place for short ML routines in the 128 is from address 2816 on up.) The numbers POKEd into RAM by the assembler are the results of the assembler's translation of your *source code* (the program above) into pure machine langauge.

DATA By Hand

To put these numbers into your BASIC program, you could display them onscreen by typing:

```
FOR I = 866 TO 881: PRINT PEEK(I);:
  NEXT
```

and copying the results into a DATA statement within your program. It would look like this:

```
10 DATA 169,147,32,210,255,160,0,
   169,65,32,210,255,136,208,250,96
```

Then you simply would add a POKE loop in your BASIC program, which will recreate the pure ML from your DATA line:

```
20 FOR I = 866 TO 881: READ D: POKE
   I,D: NEXT
```

That's it. When the BASIC program is run, it will first build the ML into RAM, and then, whenever your program needs to quickly print *A* on the screen 256 times, you just SYS 866 to your ML subroutine. When the job is finished, that last machine language instruction (RTS, ReTurn from Subroutine) sends control of the computer back to the BASIC program and the BASIC command after the SYS is executed.

However, if you have a large ML program which you want to transform into BASIC DATA statements, the above method is too cumbersome. Here are datamaker programs for the 64 and 128 which will do the job. They will build a cluster of BASIC DATA statements from an ML program; you supply the starting and ending address of the ML and the computer does the rest.

Datamaker 64

```
FK 1 INPUT"{CLR}{BLK}STARTING
     {SPACE}ADDRESS";S:INPUT"E
     NDING ADDRESS";F
RH 2 PRINT"{CLR}{2 DOWN}":FORI
     =STOS+47STEP6
XR 3 IFI>FTHENNEXT:PRINT"GOTO
     {SPACE}7":GOTO6
XD 4 PRINTI;"DATA";:FORJ=ØTO5:
     R$=STR$(PEEK(I+J)):PRINTR
     IGHT$(R$,LEN(R$)-1);",";
JA 5 NEXTJ:PRINTCHR$(2Ø):NEXTI
     :PRINT"S="S+48"{LEFT}:F="
     F"{LEFT}:GOTO 2"
GH 6 POKE198,1Ø:FORK=1TO1Ø:POK
     E63Ø+K,13:NEXTK:PRINT"
     {HOME}":END
RB 7 PRINT"{CLR}{2 DOWN}":FORM
     =1TO8:PRINTM:NEXTM
AF 8 POKE198,8:FORK=1TO8:POKE6
     3Ø+K,13:NEXTK:PRINT"
     {HOME}":END
```

Datamaker 128

```
FK 1 INPUT"{CLR}{BLK}STARTING
     {SPACE}ADDRESS";S:INPUT"E
     NDING ADDRESS";F
RH 2 PRINT"{CLR}{2 DOWN}":FORI
     =STOS+47STEP6
XR 3 IFI>FTHENNEXT:PRINT"GOTO
     {SPACE}7":GOTO6
XD 4 PRINTI;"DATA";:FORJ=ØTO5:
     R$=STR$(PEEK(I+J)):PRINTR
     IGHT$(R$,LEN(R$)-1);",";
KF 5 NEXTJ:PRINTCHR$(2Ø):NEXTI
     :PRINT"GOTO 2"
SJ 6 POKE2Ø8,1Ø:FORK=1TO1Ø:POK
     E841+K,13:NEXTK:PRINT"
     {HOME}":S=S+48:END
RB 7 PRINT"{CLR}{2 DOWN}":FORM
     =1TO8:PRINTM:NEXTM
CG 8 POKE2Ø8,8:FORK=1TO8:POKE8
     41+K,13:NEXTK:PRINT"
     {HOME}":END
```

Text Framer

Paul Sawyer

Frame text or character graphics with this utility that lets you easily create any size and color of frame and put it anywhere on the screen. For the Commodore 128, 64, Plus/4, and 16.

"Text Framer" is a small machine language (ML) program that can greatly improve the appearance of your BASIC programs. It lets you draw frames on the screen at ML speed—frames of any size, any color, and made up of any characters that you choose. You can make your own pop-up windows, divide the screen into sections, or frame the entire screen.

Versions are included for the Commodore 128, 64, and the Plus/4 and 16. (The 128 version can draw frames only on the 40-column screen, not on the 80-column display.) The program is a BASIC loader. Since it contains a machine language program in the form of DATA statements, use the "Automatic Proofreader" program located elsewhere in this issue to insure accurate entry. Type in the version for your computer and be sure to save a copy to tape or disk.

When you load the program and type RUN, the program will be POKEd into memory, but nothing else will happen. To use the program to make a frame, you must use a SYS command to call the ML routine. Before calling the routine, you'll probably want to set parameters appropriately. The accompanying table shows the key addresses for each machine.

The default values in the table are the numbers that are set when the program is first run. If you do a SYS 49152 on the 64, a SYS 3072 on the 128, or a SYS 819 on the Plus 4 or 16, you'll get a frame with an upper-left corner at 0, 0 and a lower-left corner at 11, 11. (The length parameters do not include the edges of the frame, so a frame that surrounds a 10 × 10 square is really 12 × 12.) The color of the frame will be white (1), and the frame will be made of the default parameters (straight lines with rounded corners).

The program uses line numbers 10–350, so begin your own program at line 360 when adding frames to your own displays.

Let's change the appearance of the frame by making the horizontal character an equal sign. We'll make the change for the Commodore 64. If you're working with another computer, use the table to find the correct location to POKE. Now, add this line to the program:

```
360 POKE 49160,61: SYS 49152: REM 61
  IS SCREEN CODE FOR =
```

Now run the program.

You can change any parameter simply by POKEing the desired value into the proper location. The character numbers (49160–49165) are screen codes, not ASCII codes, so check your programmer's guide or COMPUTE!'s *Mapping The 64* for the appropriate values. On the Plus/4 and 16, the color parameter can range from 0 to 255. To figure the correct number to POKE, use the following formula:

```
luminance * 16 + color number
```

POKE the result into 826. Luminance can range from 0 to 7, and color number can range from 0 to 15. Add 128 to this value for a flashing frame.

The program does error checking, so you don't have to worry about crashing your computer when you use it. If the border won't fit on the screen, the computer will give an illegal quantity error.

See program listings on page 83.

Plus/4 and 16	128	64	Default	Purpose
819	3072	49152		SYS address
822	3075	49155	0	top left X coordinate
823	3076	49156	0	top left Y coordinate
824	3077	49157	10	horizontal length
825	3078	49158	10	vertical length
826	3079	49159	1	color (0 on Plus/4, 16)
827	3080	49160	64	screen code for horizontal frame character
828	3081	49161	66	screen code for vertical frame character
829	3082	49162	85	screen code for top left corner character
830	3083	49163	73	screen code for top right corner character
831	3084	49164	74	screen code for bottom left corner character
832	3085	49165	75	screen code for bottom right corner character

All programs listed in this magazine are available on the GAZETTE Disk. See details elsewhere in this issue.

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Reader Rabbit Vs. Rambo

Fred D'Ignazio
Associate Editor

How can Reader Rabbit (the character from The Learning Company's educational software package of the same name) compete with Rambo (the Force of Freedom)?

That's the question I ask myself every weekday morning when I wake up, and the first sounds I hear are machine guns firing, tanks rolling, and bombs falling in our living room.

Reader Rabbit is a cute little guy in red overalls. If you guess all the *g* words, he does a little jig. He could be a good influence on my seven-year-old son Eric—he knows a lot about word parts.

Rambo, on the other hand, is a questionable pal to my son. I'm glad he's a red-blooded American and all that, but do I have to brush my teeth in the morning to the syncopated bursts of bullets fired from Rambo's automatic rifle? And must I suffer through his grunts and challenges to the endless stream of enemies who appear in my home, unannounced, even before I sit down to breakfast?

I finally decided I had to do something about my son's choice of early-morning playmates. The next morning when Eric stumbled out of his bedroom in his Ninja pajamas, I was ready. When Eric pressed the TV *on* switch, Rambo failed to appear. In his place was Reader Rabbit, wearing his blue train engineer's cap, his word train parked in front of the word factory.

"Hey!" I said, feigning surprise. "That's strange. I guess they took Rambo off the TV this morning and put Reader Rabbit on in his place."

At first Eric didn't say anything. He looked surprised and not particularly pleased.

Trying to press my advantage, I continued: "Oh well," I said. "Since Reader Rabbit is on TV today, we might as well make the best of it." I reached under the couch where I had hidden the Commodore 64 keyboard (on a long monitor cord). "Hey! Lookee here! A keyboard. Maybe we can make it control Reader Rabbit." I pressed a few keys and Reader Rabbit's train pulled away from the word factory, loaded with the words *sip* and *rip*. "Neat, huh?" I said to Eric. "Here, you try it." I slid the keyboard toward Eric.

But Eric had disappeared.

From behind the TV came an angry shout: "Daddy! You tricked me!" A moment later, Reader Rabbit disappeared from the screen and there instead was Rambo, heaving a grenade. Anti-aircraft fire echoed through the living room. Eric crawled around the side of the TV, looking mad.

I leaped to my feet, my face beet red. "Well!" I exclaimed. "What d'you know? Your buddy Rambo's back. How nice!" I backed quickly toward the kitchen door.

I fled into the kitchen, pursued by rumbling tanks, bazooka blasts, and surface-to-air missiles. Round 1 was history. The score: Rambo, 1, Rabbit, 0.

"Rambo may have won the battle," I muttered as I poured apple juice into Eric's mug, "but he hasn't won the war." After all, the rabbit and I were tough. As I buttered Eric's toast and stirred his scrambled eggs into a pan of sizzling butter, I was lost in thought, plotting our next encounter with the "Force of Freedom."

Adopt A Computer Store

Just a note to all you parents, teachers, and principals out there who would like to see more computers in your children's school.

Here in Alabama we are going through budget proration. What this means is that an already low state education budget has been slashed even lower. There is barely enough money around our school to pay for electricity and plumbing, much less for new computers.

We have been holding our share of skating parties, T-shirt and bake sales, and so on. And we have also come up with a neat idea for getting hold of computers, software, and computer supplies like paper, disks, and printing ribbons.

Our idea: Adopt a local computer company. That's right! *We* adopted *them*! This is similar to the Adopt-A-School programs that many schools are doing with local corporations. Except here our school is adopting the company, rather than the other way around.

The school's students are the adoptive parents, and they take their parenting seriously. They have become the company's public relations department and ad agency rolled into one. They print brochures, posters, and banners advertising the company's products and spread them around shopping malls, parking lots, and local churches, swimming pools, and skating rinks. They sing praises about the company at the dinner table each night, hoping that Mom or Dad might be interested in buying a home computer.

In return, the computer company, Village Computers, in Birmingham, has been extremely generous. They have donated supplies and loaned us computers, printers, and monitor screens. They have given us discounts and special deals on software. Everyone has benefitted. The kids have strengthened their communications skills and are proud of the fact that they are helping their school. And parents have recognized the school's special efforts and have donated computer equipment and desperately needed funds to purchase new computers.

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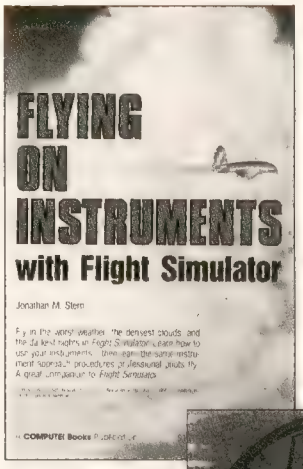

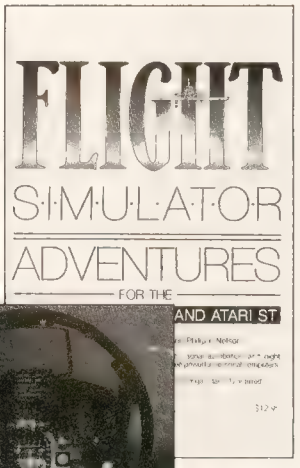

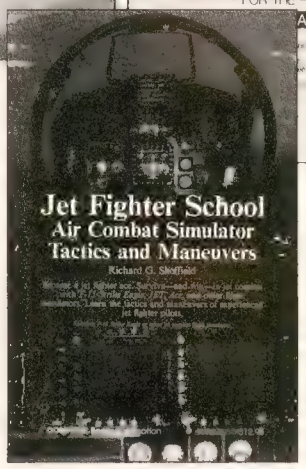

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If you've discovered a clever time-saving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s Gazette. If we use it, we'll pay you $35. We regret that, due to the volume of items submitted, we cannot reply individually to submissions.

This Or That, But Not Both

Tim Pickett

Good BASIC programmers can shorten their code with the logical operators AND and OR. There's a useful operator that's missing from BASIC, though: Exclusive OR (EOR). With AND, the result is 1 if and only if both operands are 1. With OR, the result is 1 if either of the operands was 1. With EOR, the result is 1 only if one of the operands was 1 and the other was 0.

EOR can be simulated with both the AND and OR functions. Here's an example:

```
X=(A OR B)-(A AND B)
```

X will be the EOR of A and B. The EOR, like AND and OR, is taken for each bit.

Are You On?

Steven M. Eyler Jr.

Have you ever used a program that broke out with a *DEVICE NOT PRESENT* error message? Here's a way to check to see if a device is on before you try to use it. This example checks the disk drive:

```
10 OPEN 2,8,2
20 CLOSE 2
30 IF ST=0 THEN 60
40 PRINT "PLEASE TURN ON THE
   DISK DRIVE AND PRESS A KEY."
50 GET A$:IF A$="" THEN 50
55 GOTO 10
60 REM *** PROGRAM CONTINUES
   ***
```

This should be at the beginning of your program to check that the user's disk drive is on. If you want to use it as a subroutine, replace line 30 with this line:

```
30 IF ST=0 THEN RETURN
```

If you want to make sure that the printer is on instead of the drive, replace the following two lines:

```
10 OPEN 2,4,7
40 PRINT "PLEASE TURN ON YOUR
   PRINTER AND PRESS A KEY."
```

ST is a reserved variable. You can check the value of ST, but you can't assign a value to it. If it is equal to −128, then the device is not present. If ST is 0 then no errors were encountered.

Colors And Bells

Michael A. Lang

Commodore computers have many features that are available through the PRINT command. Cursor controls and color keys can be imbedded in strings. This allows for powerful screen handling. On the 128, you can even get a bell sound from a PRINT statement: PRINT CHR$(7).

The price of this flexibility is the illegible strings produced when using this technique. My solution is to define several strings at the beginning of every program. Here's an example:

```
10 HM$="{HOME}"
20 UP$="{UP}"
30 DN$="{DOWN}"
40 LT$="{LEFT}"
50 RT$="{RIGHT"
60 BK$="{BLK}"
70 WT$="{WHT}"
80 RD$="{RED}"
90 CY$="{CYN}"
100 PL$="{PUR}"
110 GN$="{GRN}"
120 BL$="{BLU}"
130 YL$="{YEL}"
140 OG$="{<1>}"
150 BN$="{<2>}"
160 LR$="{<3>}"
170 DG$="{<4>}"
180 MG$="{<5>}"
190 LG$="{<6>}"
200 LB$="{<7>}"
210 GY$="{<8>}"
```

Now it's easy to change colors and move the cursor—just print the string variable.

Of course, you may not need all the color codes, so you can just define the ones that you want to use. If you do want all the color keys, here's an alternative to the long list of colors above. Just type this line instead of lines 60–210 above:

```
60  CL$="{BLK}{WHT}{RED}{CYN}
    {PUR}{GRN}{BLU}{YEL}{<1>}
    {<2>}{<3>}{<4>}{<5>}
    {<6>}{<7>}{<8>}"
```

Now, anytime you want a color, just give the color key number, 1–16, in an expression like this:

```
1000 PRINT MID$(CL$,color number,1)
```

The MID$ function lets us pick any color from the color string.

A variation on this technique is to define the cursor key variables like this:

```
20 UP$="{24 UP}"
30 DN$="{24 DOWN}"
40 LT$="{40 LEFT}"
50 RT$="{40 RIGHT}"
```

Now you can print as many cursor controls as you like. This line will home the cursor, then move the cursor ten rows to the right and ten lines down:

```
1000 PRINT HM$;LEFT$(RT$,10);LEFT
     $(DN$,10)
```

The LEFT$ function simply gives us exactly as many of the cursor movements as we need.

simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s Gazette tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o COMPUTE's Gazette, P.O. Box 5406, Greensboro, NC 27403.

Q. I have seen in some BASIC programs what appears to be a machine language subroutine. There is usually a FOR-NEXT loop to POKE numbers from DATA statements into memory locations starting at 49152. Then, elsewhere, the program will SYS 49152. How does one come up with the numbers in the DATA statements?

A. You are correct in deducing that the numbers you have seen in DATA statements are often machine language commands, especially when they're POKEd into memory starting at address 49152 and followed by a SYS 49152 command. (SYS is like GOTO or GOSUB, except that it transfers control to a machine language subroutine instead of a BASIC subroutine. And 49152 is a popular address for storing machine language subroutines on the Commodore 64, because 4K of free memory is available starting at that address.)

To come up with the numbers that go in the DATA statements, you must write the machine language subroutine using either a *machine language monitor* or an *assembler*. Both are utilities for writing machine language programs. Most programmers these days prefer assemblers because they're easier to use.

With an assembler, you type in machine language commands in a form known as *mnemonics*. For instance, one mnemonic command is LDA, which stands for *load accumulator*. This is a very simple command which loads the following number into a special memory register called the accumulator. It's roughly like assigning a number to a variable in BASIC, such as A=1. Another mnemonic command is JMP, which stands for *jump*. This is similar to GOTO in BASIC. The mnemonic command RTS means *return from subroutine*, which is similar to RETURN in BASIC. The 6502/6510 microprocessor found in the Commodore 64 has about 50 of these mnemonic commands in its machine language.

After you've written your program with commands like LDA, JMP, and RTS, you tell the assembler to convert the mnemonics into the numbers which are recognized by the microprocessor as machine language commands. This process is called *assembling*. For instance, the number for LDA is A9 in hexadecimal (the base 16 numbering system commonly used in machine language), or 169 in decimal. Therefore, if you see a DATA line in a BASIC program that contains the sequence 169,0, it probably means *load accumulator with zero* in machine language.

Here's another clue: If you look closely at DATA statements that contain machine language subroutines, you'll notice that many of them end with the number 96. That's because 96 is the decimal code for RTS, return from subroutine. It's common for a machine language subroutine to end with this command, just as most BASIC subroutines end with RETURN.

If you want to program in machine language, the first step is to find a book that explains what the various mnemonics mean. Then you should look around for an assembler so you can try writing short programs. Also see the "Machine Language for Beginners" column that runs monthly in GAZETTE.

Q. I own a Commodore 64C and a Coleco Adam Smartwriter printer. I'd like to use the Smartwriter with my 64C. Is there an interface or plug that will make the two devices compatible?

A. We've never heard of an interface for connecting the Smartwriter printer to anything besides a Coleco Adam computer. A qualified technician could perhaps make an interface, but the task would be hazardous. Since the Smartwriter contains the power supply for the entire Adam system, hooking up a wire to the wrong pin could seriously damage your computer.

Q. I have seen some very interesting software advertised in international computer magazines—software I have yet to see here in the U.S. How would I go about mail-ordering this software? How would I convert dollars to pounds? How do I figure international shipping rates? How much does it cost to send a letter abroad, anyway?

A. If you want to buy software from other countries, our advice is to write to the companies advertising the software to see if they'll ship their products to the U.S., and, if so, how much extra they require for shipping. You can determine the exchange rates between dollars and other currencies by consulting *The Wall Street Journal*, *USA Today*, or the business sections of many other daily newspapers. (The rates fluctuate daily.) Some foreign companies may accept U.S. funds, although given the plunging value of the dollar in international money markets lately, they may prefer their own currency.

The postage required for overseas mail is 33 cents for a postcard and 44 cents per half-ounce for a letter. A typical one- or two-page letter weighs about an ounce.

Todd Heimarck
Assistant Editor

This month we'll check the mailbag for comments from readers.

Sorting: Divide And Conquer

The May 1987 "Horizons" column about alphabetizing with bubble sorts and Shell sorts prompted Ronald Sodestrom to write about his method of sorting strings. If you don't recall that column, the point was that bubble sorts are inefficient because when you double the size of the list, the time needed to alphabetize increases by a factor of 4. As the list grows, the bubble sort needs more and more time until it becomes a lumbering dinosaur. Shell sorts outperform bubble sorts, especially when you're dealing with long lists.

As you may have guessed, that principle works both ways. If you cut the list in half, the time it takes to bubble sort each part is much less than half the time it takes to sort the list as a whole.

If you go further and split a large array into 26 tiny arrays, sorting is dramatically faster. That's how Mr. Sodestrom sorts strings, dividing the list into separate lists (actually, a two-dimensional array), based on the first letter of each string (words beginning with the letter *A* go on one list, *B* is a second list, and so on, up to Z). The main algorithm is similar to the bubble sort, but the size of each array is relatively small, so the program runs much faster.

Of course, since the 26 individual arrays are put into order with a variation of the bubble sort, they're still subject to the basic inefficiency of bubble sorts. As the list grows in size, the calculations take longer.

As long as we're on the topic of sorting, some other approaches are worth mentioning. The May example programs switched two strings with a line like this:

```
IF N$(J) > N$(J+1) THEN TEMP$ =
  N$(J): N$(J) = N$(J+1): N$(J+1) =
  TEMP$
```

You literally swap two strings in memory. It's like looking at a classroom full of schoolchildren and saying, "Smith, you're ahead of Jones, and you shouldn't be. You two must trade desks."

A second way to alphabetize the kids in the classroom would be to keep a list. You'd leave the kids at their desks in scrambled order, but alphabetize their names on index cards. If Smith and Jones were out of order, you'd move the cards around.

To do something similar in a computer, you'd leave the strings where they are—in scrambled order—and alphabetize a list of pointers. The string array is in random order, but there's a separate numeric array that tells you which string is first, second, third, and so on. To put two strings in place, use a line like this:

```
IF N$(P(J))>N$(P(J+1)) THEN T = P(J):
  P(J)=P(J+1): P(J+1)=T
```

That's how a pointer sort works. If you're working with relative files, you can leave each record where it is on the disk and create a list of numbers that tells you the alphabetical order (instead of moving the files around on the disk). Also, if you sometimes need to alphabetize by last name and sometimes sort records by ZIP code (for mailings), you can keep two lists of pointers. Pointer sorts also help you avoid some of the problems associated with garbage collection (see the September 1986 "Horizons" column for more about garbage collection).

Insertion sorts are worthwhile in some applications. Let's say you keep track of 5135 members of a club and the computer takes an hour to alphabetize the members' names. If the list is fairly static, meaning there are only a few additions or deletions in a month, it's easier to insert or delete names alphabetically as they're typed in, rather than sorting the whole list every time it has to be printed or accessed. You don't ever sort the items, because they're always in order.

Beyond pointer sorts and insertion sorts, the topic of sorting ventures into strange and interesting areas like hash tables, linked lists, and binary trees.

A Correction For Shell Sort

Another reader, Merle Orsborn, found a bug in the Shell sort example program in the May column. If two of the strings in the array are exactly the same, the Shell sort goes into an endless loop, forever swapping them. To fix it, change the < (less than) in line 150 to =< (equal to or less than).

The bug didn't appear in testing because the example program generated 80 or 160 random strings and no 2 happened to be exactly the same. Thanks to Mr. Orsborn for discovering it and suggesting the correction.

A One-Screen Program

The December 1986 column discussed some of the advantages of the 128's BASIC 7.0 and suggested that it's quite possible to write useful and interesting one-screen programs. A one-screen program is one so short that when you LIST it, it doesn't scroll; you can see the whole listing on one screen. Many of the BASIC 7.0 keywords are so powerful that a game or short utility can be written in just a few lines.

Several readers responded with short programs. Following is an interesting hi-res graphics demonstration written by Roger Moore. Note that it requires a Commodore 128 with a 40-column display.

A Bit Of Art

```
1 GRAPHIC0:COLOR4,1:COLOR0,
  1:PRINT"{CLR}{2 DOWN}
  {WHT}*1*","{RED}*2*","
  {CYN}*3*","{PUR}*4*","
  {DOWN}{GRN}*5*","{BLU}*6*
  ","{YEL}*7*","{RVS}*8*","
  {DOWN}{RVS}*9*","{RVS}*10*","
  {RVS}*11*","{RVS}*12*","
  {DOWN}{RVS}*13*","{RVS}*14*",
  "{RVS}*15*"
2 PRINT"{2 DOWN}{RVS}WHAT COL
  OR WOULD YOU LIKE YOUR DE
  SIGN...":INPUT"{2 DOWN}CH
  OOSE 1 TO 15 PLEASE";C:IF
  C<1ORC>15THEN1
3 COLOR1,INT(C+1):INPUT"
  {2 DOWN}{CYN}HOW MANY POI
  NTS (3 TO 30)";P:IFP<3ORP
  >30THEN3
4 DIMX1(100),Y1(100):C=1:GR
  APHIC1,1:SCALE1,1000,1000
  :CIRCLE1,500,500,400,450,
  ,,,1:FORI=0TO2*↑STEP2*↑*(
  1/P):X=INT(500+400*(SIN(I
  )))
5 Y=INT(500+450*(COS(I))):X
  1(C)=X:Y1(C)=Y:C=C+1:NEXT
  :FORA=1TOP:FORB=ATOP:DRAW
  1,X1(B),Y1(B)TOX1(A),Y1(A
  ):NEXTB,A
6 A=1:M$(0)="{2 SPACES}PRES
  S 'RETURN' TO MAKE A NEW
  {SPACE}DESIGN":M$(1)="
  {5 SPACES}PRESS THE 'SPAC
  E BAR' TO QUIT{3 SPACES}"
  :DO:A=-(A=0):CHAR1,0,24,M
  $(A):FORI=1TO100:GOSUB7:N
  EXT:LOOP
7 GET R$:IFR$=CHR$(13)THENR
  UN:ELSEIFR$=CHR$(32)THENG
  RAPHIC0,1:END:ELSE RETURN
```

GEOS Books For Users And Programmers

A few months after the October 1986 column appeared, Wayne Dempsey wrote to ask when the *GEOS Programmer's Reference Guide* would be available. It has been out for several months now, and is written by Berkeley Softworks (the creators of *GEOS*) and published by Bantam. The *GEOS Programmer's Reference Guide* is for programmers, not casual users. It has vital information like memory maps, built-in Kernal-type routines, how icons and hi-res pictures are stored, how the disk sectors are laid out, and so on. A knowledge of machine language is essential.

If you're interested in writing *GEOS* programs, be prepared to revise your attitudes about programming. BASIC and ML programmers are used to being in charge: Your program takes over the computer and handles things like interpreting keyboard commands, drawing screens, moving sprites, and so on. Programming in BASIC and ML is something like sailing a small boat where you do everything: watch the wind, move the sails around, check the compass, read the map, and so on.

In *GEOS* programs, you don't need to handle the details. Programs are event-driven. Events include things like joystick or mouse movements, the clicking of the button, a keypress on the keyboard, or a timer event. Within your program, you set things up, telling *GEOS* what kind of window or menus you'd like; then you give it a list of events you're interested in, and the program ends. You give control back to *GEOS*. You don't have to monitor the joystick port and move the pointer around; *GEOS* does that for you.

To extend the sailing metaphor, it's like a ship captain who plans to take a nap and leaves instructions to be awakened if the ship approaches an iceberg, if the admiral calls, or if something important happens. The crew takes care of the details. In this case, *GEOS* is the crew.

If you think you might someday write programs for the Macintosh, Amiga, or ST, you'll need to learn how event-driven programs work. *GEOS* might be a good starting place for experimentation.

Other books for *GEOS* users include *COMPUTE!'s User's Guide to GEOS* (COMPUTE! Books), *How to Get the Most Out of GEOS* (Midnite Press), and *GEOS Inside and Out* (Abacus Books). The latter two books also contain some useful information about programming with *GEOS*. (Incidentally, those interested in *GEOS* should see the announcement concerning the debut of "The *GEOS* Column" in this magazine. It's found on page 42.)

If you have suggestions or comments about the this column, write to COMPUTE!'s Gazette, Horizons Column, P.O. Box 5406, Greensboro, NC 27403.

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Easy Full-Screen Animation

See instructions in article on page 60 before typing in.

Program 1: Animator—BASIC Program

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
ED 20 POKE55,255:POKE56,31
QQ 30 IFA=1THEN60
SG 40 IFA=2THEN130
FG 50 A=1:LOAD"ANIMATOR",8,1
QA 60 PRINT"{CLR}{3 RIGHT}COPY
      RIGHT 1987 COMPUTE! PUB.
      , INC."
CG 70 PRINTTAB(9)"ALL RIGHTS R
      ESERVED"
ES 80 INPUT"{2 DOWN}BACKGROUND
       COLOR";B:PRINT
FP 90 INPUT"LINE COLOR";L:PRIN
      T
FE 100 POKE49153,B:POKE49176,1
      6*L+B
CS 110 INPUT"DATA FILE NAME";F
      $
XR 120 A=2:LOAD F$,8,1
GQ 130 SYS49152
ER 140 POKE53280,14:POKE53281,
      6:PRINTCHR$(147);CHR$(1
      54);
```

Program 2: Animator—ML Program

```
C000:A9 0B 8D 20 D0 A9 00 85 7F
C008:FB 85 FD A9 04 85 FC A9 1D
C010:60 85 FE A2 04 A0 00 A9 79
C018:1B 91 FB 91 FD C8 D0 F9 D2
C020:E6 FC E6 FE CA D0 F2 AD 4E
C028:11 D0 09 20 8D 11 D0 A9 85
C030:40 85 FC 20 13 C1 AD 00 CF
C038:DD 29 FC 09 02 8D 00 DD 47
C040:A9 80 8D 18 D0 20 2C C1 0B
C048:98 48 20 E4 FF C9 00 F0 92
C050:03 4C C5 C0 68 A8 A9 20 84
C058:85 FC 20 13 C1 A9 20 8D 93
C060:95 C3 20 DC C0 E0 00 F0 E9
C068:F9 A9 00 CD 12 D0 D0 F9 9D
C070:AD 00 DD 09 03 8D 00 DD 41
C078:A9 18 8D 18 D0 E0 FE F0 01
C080:03 20 2C C1 98 48 20 E4 38
C088:FF C9 00 F0 03 4C C5 C0 21
C090:68 A8 A9 40 85 FC 20 13 1D
C098:C1 A9 40 8D 95 C3 20 DC 1F
C0A0:C0 E0 00 F0 F9 A9 00 CD 0E
C0A8:12 D0 D0 F9 AD 00 DD 29 73
C0B0:FC 09 02 8D 00 DD A9 80 57
C0B8:8D 18 D0 E0 FE F0 03 20 11
C0C0:2C C1 4C 48 C0 68 AD 00 D9
C0C8:DD 09 03 8D 00 DD AD 11 98
C0D0:D0 29 DF 8D 11 D0 A9 14 0D
C0D8:8D 18 D0 60 B1 FD 8D 81 69
C0E0:C3 C8 B1 FD 8D 7D C3 C8 3F
C0E8:B1 FD 8D 7E C3 C8 B1 FD FE
C0F0:8D 82 C3 C8 B1 FD 8D 7F FE
C0F8:C3 C8 B1 FD 8D 80 C3 C8 63
C100:C8 B1 FD 48 98 48 20 37 F5
C108:C1 68 A8 68 AA C8 D0 02 3E
C110:E6 FE 60 A9 00 85 FB 98 14
C118:48 A2 20 A9 00 A0 00 91 1B
C120:FB C8 D0 FB E6 FC CA D0 3F
C128:F4 68 A8 60 A9 00 85 FD B1
C130:A9 64 85 FE A0 00 60 A9 B1
C138:00 8D 92 C3 8D 87 C3 A9 69
C140:01 8D 86 C3 8D 88 C3 AD 78
C148:7F C3 38 ED 7D C3 8D 83 FB
C150:C3 8D 8F C3 AD 80 C3 ED 2C
C158:7E C3 8D 84 C3 8D 90 C3 3F
C160:10 1F A9 FF 8D 86 C3 8D 84
C168:87 C3 A9 00 38 ED 83 C3 1A
C170:8D 83 C3 8D 8F C3 A9 00 CB
C178:ED 84 C3 8D 84 C3 8D 90 44
C180:C3 AD 82 C3 38 ED 81 C3 1E
C188:8D 85 C3 8D 91 C3 B0 11 93
C190:A9 FF 8D 88 C3 A9 00 38 20
C198:ED 85 C3 8D 85 C3 8D 91 AD
C1A0:C3 0E 8F C3 2E 90 C3 0E 01
C1A8:91 C3 2E 92 C3 AD 84 C3 76
C1B0:F0 03 4C 4F C2 AD 83 C3 83
C1B8:CD 85 C3 90 03 4C 4F C2 B0
C1C0:AD 8F C3 8D 89 C3 38 ED 0A
C1C8:91 C3 8D 8B C3 AD 90 C3 2A
C1D0:8D 8A C3 ED 92 C3 8D 8C 60
C1D8:C3 AD 89 C3 38 ED 85 C3 5F
C1E0:8D 8D C3 AD 8A C3 E9 00 19
C1E8:8D 8E C3 AE 85 C3 E8 8E D5
C1F0:93 C3 AE 7D C3 AC 81 C3 74
C1F8:AD 7E C3 20 FD C2 AD 81 45
C200:C3 18 6D 88 C3 8D 81 C3 BE
C208:AD 8E C3 30 2C AD 7D C3 5A
C210:18 6D 86 C3 8D 7D C3 AD A1
C218:7E C3 6D 87 C3 8D 7E C3 09
C220:AD 8D C3 18 6D 8B C3 8D 88
C228:8D C3 AD 8E C3 6D 8C C3 B4
C230:8D 8E C3 CE 93 C3 D0 BA 8D
C238:60 AD 8D C3 18 6D 89 C3 94
C240:8D 8D C3 AD 8E C3 6D 8A 2C
C248:C3 8D 8E C3 18 90 E4 AD 9B
C250:91 C3 8D 89 C3 38 ED 8F 44
C258:C3 8D 8B C3 AD 92 C3 8D 9D
C260:8A C3 ED 90 C3 8D 8C C3 14
C268:AD 89 C3 38 ED 83 C3 8D B5
C270:8D C3 AD 8A C3 ED 84 C3 AE
C278:8D 8E C3 AD 83 C3 8D 93 95
C280:C3 AD 84 C3 8D 94 C3 AE 15
C288:7D C3 AC 81 C3 AD 7E C3 01
C290:20 FD C2 AD 7D C3 18 6D 71
C298:86 C3 8D 7D C3 AD 7E C3 71
C2A0:6D 87 C3 8D 7E C3 AD 8E FC
C2A8:C3 30 3C AD 81 C3 18 6D 37
C2B0:88 C3 8D 81 C3 AD 8D C3 E8
C2B8:18 6D 8B C3 8D 8D C3 AD 2B
C2C0:8E C3 6D 8C C3 8D 8E C3 2A
C2C8:AD 93 C3 D0 06 AD 94 C3 63
C2D0:D0 01 60 AD 93 C3 38 E9 EB
C2D8:01 8D 93 C3 AD 94 C3 E9 22
C2E0:00 8D 94 C3 4C 87 C2 AD 4C
C2E8:8D C3 18 6D 89 C3 8D 8D 04
C2F0:C3 AD 8E C3 6D 8A C3 8D 7C
C2F8:8E C3 18 90 CB C0 C8 90 46
C300:01 60 C9 00 F0 0A C9 01 9D
C308:F0 01 60 E0 40 90 01 60 09
C310:48 8A 29 07 8D 96 C3 A9 EB
C318:07 38 ED 96 C3 8D 96 C3 9D
C320:8A 29 F8 48 A9 00 85 FC 30
C328:98 29 F8 18 2A 26 FC 2A F4
C330:26 FC 2A 26 FC 85 FB A6 4E
C338:FC 2A 26 FC 2A 26 FC 65 A6
C340:FB 85 FB 8A 65 FC 0D 95 1E
C348:C3 85 FC 68 65 FB 85 FB 5B
C350:68 65 FC 85 FC 98 29 07 01
C358:65 FB 85 FB A5 FC 69 00 F5
C360:85 FC AE 96 C3 BD 75 C3 EC
C368:8D 96 C3 A0 00 B1 FB 0D AA
C370:96 C3 91 FB 60 01 02 04 35
C378:08 10 20 40 80 00 00 00 14
```

Program 3: Love Data Filemaker

```
DA 10 POKE55,255:POKE56,99:REM
       LOVE DATA FILE MAKER
PQ 20 DIM BX(11),BY(11),EX(11)
      ,EY(11)
HE 30 FORN=0TO11:READBX(N),BY(
      N),EX(N),EY(N):NEXT
MC 40 DATA -22,3,-22,-3,-22,-3
      ,-14,-3
FC 50 DATA -10,3,-10,-3,-10,-3
      ,-2,-3
KA 60 DATA -2,-3,-2,3,-2,3,-10
      ,3
JJ 70 DATA 2,3,6,-3,6,-3,10,3
SS 80 DATA 22,3,14,3,14,3,14,-
      3
FP 90 DATA 14,-3,22,-3,20,0,14
      ,0
EQ 100 CX=160:CY=100:A=2*↑
HR 110 NS=71
SR 400 PRINTCHR$(147);:INPUT"F
       ILENAME";F$:PA=25600
SR 410 PRINT"COMPUTING SCREEN
       {SPACE}NUMBER: ";
KK 420 FORSC=1TONS:PRINT SC;
SM 430 GOSUB 1000
PJ 440 IFSC<>NSTHENPOKEPA-1,25
       4:NEXTSC
RP 450 POKEPA-1,255
RS 460 SYS57812 F$,8
SX 470 POKE193,0:POKE194,100
EX 480 POKE174,INT(PA)AND255:P
       OKE175,INT(PA/256):SYS6
       2954
AG 490 PRINT:PRINT"ANIMATION D
       ATA FILE ";CHR$(34);F$;
       CHR$(34);" IS COMPLETE"
       :END
PP 500 POKEPA,INT(Y1):PA=PA+1
JE 510 POKEPA,INT(X1)AND255:PA
       =PA+1:POKEPA,INT(X1/256
       ):PA=PA+1
AE 520 POKEPA,INT(Y2):PA=PA+1
QK 530 POKEPA,INT(X2)AND255:PA
       =PA+1:POKEPA,INT(X2/256
       ):PA=PA+1
QB 540 POKEPA,0:PA=PA+1:POKEPA
       ,0:PA=PA+1
AJ 550 RETURN
BD 1000 FORN=0TO11
GD 1010 ZE=-BX(N)*SIN(A)+30
SJ 1020 X1=50*BX(N)*COS(A)/ZE+
        CX:Y1=-100*BY(N)/ZE+CY
RS 1030 ZE=-EX(N)*SIN(A)+30
PH 1040 X2=50*EX(N)*COS(A)/ZE+
        CX:Y2=-100*EY(N)/ZE+CY
SX 1050 GOSUB 500
RR 1060 NEXTN:A=A-.0872665
MC 1070 RETURN
```

Program 4: Cube Data Filemaker

```
RJ 10 POKE55,255:POKE56,99:REM
      CUBE DATA FILE MAKER
CK 20 DIM V(8,3),SV(8,2),S(6,5
      ),N(6,3),E(12,3)
SG 30 FORI=1TO8:FORJ=1TO3:READ
      V(I,J):NEXTJ,I
AF 40 FORI=1TO6:FORJ=1TO5:READ
      S(I,J):NEXTJ,I
HA 50 DATA 40,40,-40,40,40,40,
      40,-40,40,40,-40,-40
BF 60 DATA -40,-40,-40,-40,-40
      ,40,-40,40,40,-40,40,-40
JS 70 DATA 1,2,3,4,1,1,8,7,2,1
      ,8,5,6,7,8
BQ 80 DATA 5,4,3,6,5,2,7,6,3,2
      ,4,5,8,1,4
ER 90 CX=160:CY=100:TH=.2:PH=.
      8:PD=2000:DT=20000
JA 100 NS=95
SR 400 PRINTCHR$(147);:INPUT"F
       ILENAME";F$:PA=25600
SR 410 PRINT"COMPUTING SCREEN
       {SPACE}NUMBER: ";
KK 420 FORSC=1TONS:PRINT SC;
SM 430 GOSUB 1000
PJ 440 IFSC<>NSTHENPOKEPA-1,25
       4:NEXTSC
RP 450 POKEPA-1,255
RS 460 SYS57812 F$,8
SX 470 POKE193,0:POKE194,100
EX 480 POKE174,INT(PA)AND255:P
       OKE175,INT(PA/256):SYS6
       2954
AG 490 PRINT:PRINT"ANIMATION D
```

```
      ATA FILE ";CHR$(34);F$;
      CHR$(34);" IS COMPLETE"
      :END
PP 500 POKEPA,INT(Y1):PA=PA+1
JE 510 POKEPA,INT(X1)AND255:PA
      =PA+1:POKEPA,INT(X1/256
      ):PA=PA+1
AE 520 POKEPA,INT(Y2):PA=PA+1
QK 530 POKEPA,INT(X2)AND255:PA
      =PA+1:POKEPA,INT(X2/256
      ):PA=PA+1
QB 540 POKEPA,0:PA=PA+1:POKEPA
      ,0:PA=PA+1
AJ 550 RETURN
CB 1000 S1=SIN(TH):C1=COS(TH):
      S2=SIN(PH):C2=COS(PH)
HH 1010 FORI=1TO8:X=V(I,1):Y=V
      (I,2):Z=V(I,3):SX=-X*S
      1+Y*C1
DA 1020 SY=-X*C1*C2-Y*S1*C2+Z*
      S2:SZ=-X*S2*C1-Y*S2*S1
      -Z*C2+DT
AS 1030 SV(I,1)=PD*(1.4*SX/SZ)
      +CX:SV(I,2)=-PD*(SY/SZ
      )+CY:NEXT
CQ 1040 FORI=1TO6:F=S(I,1):G=S
      (I,2):H=S(I,3):U1=V(G,
      1)-V(F,1):U2=V(G,2)-V(
      F,2)
QR 1050 U3=V(G,3)-V(F,3):V1=V(
      H,1)-V(F,1):V2=V(H,2)-
      V(F,2):V3=V(H,3)-V(F,3
      )
XJ 1060 N(I,1)=U2*V3-V2*U3:N(I
      ,2)=U3*V1-V3*U1:N(I,3)
      =U1*V2-V1*U2:NEXT
QC 1070 XE=DT*S2*C1:YE=DT*S2*S
      1:ZE=DT*C2:M=1
XE 1080 FORI=1TO6:E2=S(I,1):WX
      =XE-V(E2,1):WY=YE-V(E2
      ,2):WZ=ZE-V(E2,3)
AG 1090 IF(N(I,1)*WX+N(I,2)*WY
      +N(I,3)*WZ)<=0THEN1140
DG 1100 E1=S(I,1):FORJ=2TO5:E2
      =S(I,J):FORK=1TOM
HK 1110 IFE(K,1)=E2ANDE(K,2)=E
      1THENE(K,3)=2:GOTO 113
      0
FG 1120 NEXTK:E(M,1)=E1:E(M,2)
      =E2:E(M,3)=1:M=M+1
SJ 1130 E1=E2:NEXTJ
FR 1140 NEXTI:FORI=1TO12:IFE(I
      ,3)=0THEN1160
SC 1150 J=E(I,1):K=E(I,2):X1=S
      V(J,1):Y1=SV(J,2):X2=S
      V(K,1):Y2=SV(K,2):GOSU
      B500
GE 1160 NEXT:TH=TH+.06544985:P
      H=PH+.06544985:IF SC<4
      8 THEN PD=PD+583.3:RET
      URN
PH 1170 PD=PD-583.3:RETURN
```

Remedy

Article on page 58.

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
GM 20 ADDRESS=49152
HM 30 BACKGROUND=12:BRDER=11:T
      EXT=0
BX 40 DEF FNHI(X)=INT(X/256):D
      EF FNLO(X)=X-FNHI(X)*256
RG 50 IF(AD>2048ANDAD<40514)OR
      (AD>49151ANDAD<52802)THE
      N70
KC 60 PRINT"{DOWN}ADDRESS IS N
      OT AVAILABLE -- TRY ANOT
      HER AND RUN AGAIN.":END
HD 70 PRINT"{CLR}{3 RIGHT}COPY
      RIGHT 1987 COMPUTE! PUB.
      , INC."
EK 80 PRINTTAB(9)"ALL RIGHTS R
      ESERVED"
HB 90 PRINT"{3 DOWN}WORKING...
      "
PK 100 FORX=ADTOAD+387:READB:Z
      =Z+B:NEXT:IFZ<>60498THE
      NPRINT"ERROR IN DATA.":
      STOP
DQ 110 RESTORE:FORX=ADTOAD+428
      :READB:Z=Z+1:IFB<256THE
      NPOKEX,B:GOTO150
SD 120 B=B-256:LO=FNLO(B)+FNLO
      (AD):HI=FNHI(B)+FNHI(AD
      )
DQ 130 IFLO>255THENHI=HI+1
EC 140 POKEX,LOAND255:X=X+1:PO
      KEX,HI
CS 150 NEXT:POKEAD+46,FNLO(AD+
      409):POKEAD+48,FNHI(AD+
      409)
XX 160 POKEAD+307,BA:POKEAD+30
      2,BR:POKEAD+297,TE:SYSA
      D
DD 170 PRINT"{DOWN}SYS"AD"TO R
      EACTIVATE REMEDY AFTER
      {SPACE}A":PRINT"COLD ST
      ART RESET.":END
QS 180 DATA 32,298,44,685,16,2
      4,48,29,32,621,165,34,2
      4,105,2,133,45,165
BF 190 DATA 35,105,0,133,46,32
      ,96,166,76,116,164,173,
      161,2,141,13,221
RK 200 DATA 96,76,568,32,552,1
      69,153,160,193,32,30,17
      1,160,6,185,629,153
FA 210 DATA 40,184,136,16,247,
      169,127,141,13,221,160,
      5,185,636,153,250,255
AD 220 DATA 136,16,247,160,3,1
      85,642,153,22,3,136,16,
      247,96,64,120,72,138
QH 230 DATA 72,152,72,169,55,1
      33,1,169,127,141,13,221
      ,172,13,221,16,3,76
RE 240 DATA 114,254,32,483,169
      ,255,32,646,32,401,32,1
      88,246,165,145,201
CR 250 DATA 244,240,118,201,12
      7,208,3,32,433,76,86,25
      4,32,483,32,204,255
CQ 260 DATA 169,0,133,19,169,7
      2,141,143,2,169,235,141
      ,144,2,32,83,228,32,21
XD 270 DATA 253,32,308,76,163,
      253,173,507,141,2,3,173
      ,508,141,3,3,96
XF 280 DATA 32,552,32,308,169,
      131,141,2,3,169,164,141
      ,3,3,108,2,3
QX 290 DATA 32,401,32,433,76,1
      02,254,72,169,55,133,1,
      104,108,254,255,169
AM 300 DATA 55,133,1,169,127,1
      41,13,221,173,505,141,2
      4,3,173,506,141,25
PA 310 DATA 3,96,347,446,32,48
      3,56,110,685,160,13,185
      ,43,0,153
MR 320 DATA 687,136,16,247,173
      ,131,2,141,701,173,132,
      2,141,702,169,5,141
FG 330 DATA 22,208,169,160,32,
      646,108,252,255,169,0,1
      41,134,2,169,7,141
FQ 340 DATA 32,208,169,1,141,3
      3,208,96,78,685,165,49,
      201,3,208,246,165,50
XA 350 DATA 201,8,208,240,160,
      13,185,687,153,43,0,136
      ,16,247,173,701,141
CF 360 DATA 131,2,173,702,141,
      132,2,56,165,45,229,43,
      201,2,208,6,165,46
QM 370 DATA 229,44,240,202,169
      ,1,168,145,43,76,51,165
      ,169,55,133,1,76
JH 380 DATA 40,184,348,509,474
      ,465,348,160,0,162,252,
      141,686,200,208
AE 390 DATA 253,238,686,208,24
      8,232,208,242,96,17,82,
      69,77,69,68,89
QX 400 DATA 32,73,83,32,65,67,
      84,73,86,69,46,13,0
```

Power BASIC: Text Framer

Article on page 75.

Program 1: Text Framer—128 Version

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XX 20 PRINT"{CLR}{3 RIGHT}COPY
      RIGHT 1987 COMPUTE! PUB.
      , INC."
CF 30 PRINTTAB(9)"ALL RIGHTS R
      ESERVED":PRINT"{DOWN}...
      LOADING ML"
GR 40 FORI=49152TO49448:READA:
      POKEI,A:X=X+A:NEXT
ER 50 IFX<>37505THENPRINT"ERRO
      R IN DATA STATEMENTS.":S
      TOP
KS 60 DATA 76,17,192,0,0,10,10
      ,1,64,66
PA 70 DATA 85,73,74,75,0,0,0,1
      73,3,192
CR 80 DATA 201,38,176,28,173,4
      ,192,201,23,176
CR 90 DATA 21,173,5,192,240,16
      ,173,6,192,240
SF 100 DATA 11,24,173,3,192,10
      9,5,192,201,39
XG 110 DATA 144,3,76,72,178,24
      ,173,4,192,109
HE 120 DATA 6,192,201,24,176,2
      42,173,136,2,133
AA 130 DATA 252,56,169,216,229
      ,252,141,15,192,174
BB 140 DATA 3,192,134,251,174,
      4,192,240,11,169
AQ 150 DATA 40,141,14,192,32,2
      38,192,202,208,250
CG 160 DATA 173,10,192,141,16,
      192,32,12,193,174
XG 170 DATA 5,192,169,1,141,14
      ,192,173,8,192
FJ 180 DATA 141,16,192,32,238,
      192,32,12,193,202
DB 190 DATA 208,247,173,11,192
      ,141,16,192,32,238
RC 200 DATA 192,32,12,193,173,
      9,192,141,16,192
KX 210 DATA 174,6,192,169,40,1
      41,14,192,32,238
FC 220 DATA 192,32,12,193,202,
      208,247,173,13,192
SQ 230 DATA 141,16,192,32,238,
      192,32,12,193,173
GP 240 DATA 8,192,141,16,192,1
      69,1,141,14,192
XS 250 DATA 174,5,192,32,253,1
      92,32,12,193,202
EQ 260 DATA 208,247,173,12,192
      ,141,16,192,32,253
```

```
BH 270 DATA 192,32,12,193,173,
       9,192,141,16,192
QC 280 DATA 169,40,141,14,192,
       174,6,192,32,253
FB 290 DATA 192,32,12,193,202,
       208,247,96,24,165
GK 300 DATA 251,109,14,192,133
       ,251,165,252,105,0
DD 310 DATA 133,252,96,56,165,
       251,237,14,192,133
DP 320 DATA 251,165,252,233,0,
       133,252,96,160,0
HE 330 DATA 173,16,192,145,251
       ,24,165,252,109,15
MX 340 DATA 192,133,252,173,7,
       192,145,251,56,165
GF 350 DATA 252,237,15,192,133
       ,252,96
```

Program 2: Text Framer—64 Version

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XX 20 PRINT"{CLR}{3 RIGHT}COPY
      RIGHT 1987 COMPUTE! PUB.
      , INC."
CF 30 PRINTTAB(9)"ALL RIGHTS R
      ESERVED":PRINT"{DOWN}...
      LOADING ML"
FS 40 FORI=3072TO3368:READA:PO
      KEI,A:X=X+A:NEXT
CS 50 IFX<>26833THENPRINT"ERRO
      R IN DATA STATEMENTS.":S
      TOP
RP 60 DATA 76,17,12,0,0,10,10,
      1,64,66
CH 70 DATA 85,73,74,75,0,0,0,1
      73,3,12
RH 80 DATA 201,38,176,28,173,4
      ,12,201,23,176
RH 90 DATA 21,173,5,12,240,16,
      173,6,12,240
CS 100 DATA 11,24,173,3,12,109
       ,5,12,201,39
XK 110 DATA 144,3,76,133,134,2
       4,173,4,12,109
HM 120 DATA 6,12,201,24,176,24
       2,173,59,10,133
AM 130 DATA 252,56,169,216,229
       ,252,141,15,12,174
BG 140 DATA 3,12,134,251,174,4
       ,12,240,11,169
GB 150 DATA 40,141,14,12,32,23
       8,12,202,208,250
KF 160 DATA 173,10,12,141,16,1
       2,32,12,13,174
RD 170 DATA 5,12,169,1,141,14,
       12,173,8,12
DR 180 DATA 141,16,12,32,238,1
       2,32,12,13,202
QC 190 DATA 208,247,173,11,12,
       141,16,12,32,238
JR 200 DATA 12,32,12,13,173,9,
       12,141,16,12
CR 210 DATA 174,6,12,169,40,14
       1,14,12,32,238
MQ 220 DATA 12,32,12,13,202,20
       8,247,173,13,12
RS 230 DATA 141,16,12,32,238,1
       2,32,12,13,173
HX 240 DATA 8,12,141,16,12,169
       ,1,141,14,12
MJ 250 DATA 174,5,12,32,253,12
       ,32,12,13,202
DQ 260 DATA 208,247,173,12,12,
       141,16,12,32,253
QC 270 DATA 12,32,12,13,173,9,
       12,141,16,12
MR 280 DATA 169,40,141,14,12,1
       74,6,12,32,253
XG 290 DATA 12,32,12,13,202,20
       8,247,96,24,165
KX 300 DATA 251,109,14,12,133,
       251,165,252,105,0
XM 310 DATA 133,252,96,56,165,
       251,237,14,12,133
DP 320 DATA 251,165,252,233,0,
       133,252,96,160,0
MJ 330 DATA 173,16,12,145,251,
       24,165,252,109,15
XG 340 DATA 12,133,252,173,7,1
       2,145,251,56,165
AB 350 DATA 252,237,15,12,133,
       252,96
```

Program 3: Text Framer—Plus 4/16 Version

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XX 20 PRINT"{CLR}{3 RIGHT}COPY
      RIGHT 1987 COMPUTE! PUB.
      , INC."
CF 30 PRINTTAB(9)"ALL RIGHTS R
      ESERVED":PRINT"{DOWN}...
      LOADING ML"
XM 40 FORI=819TO1115:READA:POK
      EI,A:X=X+A:NEXT
JH 50 IFX<>25410THENPRINT"ERRO
      R IN DATA STATEMENTS.":S
      TOP
CM 60 DATA 76,68,3,0,0,10,10,0
      ,64,66
FM 70 DATA 85,73,74,75,0,0,0,1
      73,54,3
MB 80 DATA 201,38,176,28,173,5
      5,3,201,23,176
AJ 90 DATA 21,173,56,3,240,16,
      173,57,3,240
FX 100 DATA 11,24,173,54,3,109
       ,56,3,201,39
GD 110 DATA 144,3,76,28,153,24
       ,173,55,3,109
FS 120 DATA 57,3,201,24,176,24
       2,173,62,5,133
RD 130 DATA 160,56,169,8,229,1
       60,141,66,3,174
XR 140 DATA 54,3,134,159,174,5
       5,3,240,11,169
CE 150 DATA 40,141,65,3,32,33,
       4,202,208,250
BE 160 DATA 173,61,3,141,67,3,
       32,63,4,174
JA 170 DATA 56,3,169,1,141,65,
       3,173,59,3
KX 180 DATA 141,67,3,32,33,4,3
       2,63,4,202
FK 190 DATA 208,247,173,62,3,1
       41,67,3,32,33
QQ 200 DATA 4,32,63,4,173,60,3
       ,141,67,3
SD 210 DATA 174,57,3,169,40,14
       1,65,3,32,33
CR 220 DATA 4,32,63,4,202,208,
       247,173,64,3
HS 230 DATA 141,67,3,32,33,4,3
       2,63,4,173
CG 240 DATA 59,3,141,67,3,169,
       1,141,65,3
MB 250 DATA 174,56,3,32,48,4,3
       2,63,4,202
XM 260 DATA 208,247,173,63,3,1
       41,67,3,32,48
KH 270 DATA 4,32,63,4,173,60,3
       ,141,67,3
XM 280 DATA 169,40,141,65,3,17
       4,57,3,32,48
PK 290 DATA 4,32,63,4,202,208,
       247,96,24,165
RC 300 DATA 159,109,65,3,133,1
       59,165,160,105,0
PB 310 DATA 133,160,96,56,165,
       159,237,65,3,133
KM 320 DATA 159,165,160,233,0,
       133,160,96,160,0
JH 330 DATA 173,67,3,145,159,2
       4,165,160,109,66
SK 340 DATA 3,133,160,173,58,3
       ,145,159,56,165
MX 350 DATA 160,237,66,3,133,1
       60,96
```

Basketball Sam & Ed

See instructions in article on page 53 before typing in.

Program 1: Basketball Sam & Ed

```
0801:0C 08 0A 00 9E 20 32 30 64
0809:36 32 00 00 00 4C 25 09 45
0811:A9 7F 8D 0D DC A9 FF 8D 73
0819:00 DC AD 11 D0 29 80 D0 24
0821:F9 AD 12 D0 D0 FB A9 81 34
0829:8D 0D DC 60 2E 2E 2E 0E 79
0831:0F 20 13 0D 0F 0B 09 0E C8
0839:07 20 09 0E 20 14 08 05 3D
0841:20 01 15 04 09 14 0F 12 4D
0849:09 15 0D 2E 2E 2E 00 2E FF
0851:2E 2E 10 0C 05 01 13 05 1E
0859:20 15 13 05 20 14 12 01 E7
0861:13 08 20 12 05 03 05 10 70
0869:14 01 03 0C 05 13 2E 2E E3
0871:2E 00 2E 2E 2E 0F 16 05 20
0879:12 14 09 0D 05 21 2E 2E C0
0881:2E 00 2E 2E 2E 15 10 03 3A
0889:0F 0D 09 0E 07 20 03 0F 34
0891:0C 09 13 05 15 0D 20 05 BE
0899:16 05 0E 14 13 3A 00 2E A8
08A1:2E 2E 12 05 07 09 0F 0E 6F
08A9:01 0C 20 14 09 04 04 0C EE
08B1:19 17 09 0E 0B 20 03 0F 04
08B9:0E 14 05 13 14 20 37 2F 66
08C1:31 2E 2E 2E 00 2E 2E 2E E1
08C9:0E 01 14 09 0F 0E 01 0C F2
08D1:20 0D 09 03 12 0F 03 0F 68
08D9:0D 10 15 14 05 12 20 13 1C
08E1:08 0F 17 20 37 2F 32 37 B0
08E9:2E 2E 2E 00 2E 2E 2E 08 F0
08F1:0F 07 20 03 01 0C 0C 09 D8
08F9:0E 07 20 03 0F 0E 14 05 E4
0901:13 14 20 38 2F 35 2E 2E 02
0909:2E 00 2E 2E 2E 02 01 13 69
0911:0B 05 14 02 01 0C 0C 20 FC
0919:13 01 0D 20 26 20 05 04 58
0921:2E 2E 2E 00 A9 FF 8D 15 19
0929:D0 A9 80 8D 91 02 A9 01 DF
0931:8D B0 0C 8D BB 0C A9 93 85
0939:20 D2 FF A9 8E 20 D2 FF 45
0941:A9 B0 A2 05 9D C8 13 CA F9
0949:10 FA A9 00 8D CE 13 8D B2
0951:CF 13 A9 05 8D E8 12 20 E9
0959:B8 12 20 A4 15 20 DD 13 92
0961:A9 81 8D 0D DC 20 3B 18 21
0969:8D 0D DC A9 FF 8D 00 DC CE
0971:20 51 16 A9 B0 8D 3B 04 7B
0979:A9 01 8D 69 16 A9 0C 8D E5
0981:20 D0 A9 0A 8D 18 D4 A9 CD
0989:0F 8D 21 D0 A9 E4 8D F8 AC
0991:07 A9 E0 8D F9 07 A9 00 C5
0999:8D 27 D0 A9 00 8D 28 D0 48
09A1:A9 08 8D 29 D0 A9 00 8D 89
09A9:2A D0 A9 0E 8D 2B D0 A9 7F
09B1:00 8D 2C D0 8D 2D D0 8D 0A
09B9:2E D0 A9 01 8D AB 0C 8D 1D
09C1:AA 0C 8D B6 0C 8D B5 0C 57
09C9:A9 00 8D A6 0C 8D B1 0C D2
09D1:A9 00 8D A8 0C 8D B3 0C FE
09D9:A9 32 8D A7 0C A9 1E 8D 4A
09E1:B2 0C A9 32 8D A9 0C 8D 61
09E9:B4 0C 20 75 0A A9 F0 8D 1B
09F1:FD 07 8D FE 07 8D FF 07 DB
09F9:A9 80 85 61 85 63 A9 49 1E
```

```
0A01:85 64 A9 03 85 62 A0 05 52
0A09:20 50 0A 20 2A 0A A9 47 98
0A11:85 62 A0 06 20 50 0A 20 6B
0A19:2A 0A A9 8F 85 62 A0 07 F0
0A21:20 50 0A 20 2A 0A 4C BC 6B
0A29:0C 98 AA 0A A8 AD F5 0A 51
0A31:99 96 0C BD FE 0A 2D A5 35
0A39:0C 8D A5 0C A5 6D F0 09 F9
0A41:BD F6 0A 0D A5 0C 8D A5 22
0A49:0C A5 6C 99 95 0C 60 A5 37
0A51:64 18 69 32 8D F5 0A A9 EF
0A59:00 85 6D A5 62 85 6C A5 7E
0A61:61 0A 26 6C 26 6D A5 6C D2
0A69:18 69 18 85 6C A5 6D 69 7D
0A71:00 85 6D 60 A2 3F BD 2A 52
0A79:0E 9D 00 38 9D 40 38 9D 7B
0A81:80 38 9D C0 38 BD 2A 0F BF
0A89:9D 00 3B 9D 40 3B 9D 80 58
0A91:3B 9D C0 3B BD 6A 0F 9D C9
0A99:00 3C CA 10 D9 A2 BF BD AD
0AA1:6A 0E 9D 00 39 9D C0 39 1D
0AA9:CA E0 FF D0 F2 A2 0B BD 5E
0AB1:C3 0A BC CF 0A 8E F4 0A 3D
0AB9:20 DB 0A AE F4 0A CA 10 76
0AC1:EE 60 E1 E3 E7 E8 E9 ED 84
0AC9:EE E2 E3 EB EE EF 01 01 83
0AD1:01 01 01 01 01 00 00 00 DE
0AD9:00 00 A2 00 86 FC 85 FB 71
0AE1:06 FB 26 FC E8 E0 06 D0 34
0AE9:F7 C0 00 D0 03 4C CF 0D 2D
0AF1:4C FB 0D 00 00 01 02 04 D8
0AF9:08 10 20 40 80 FE FD FB 16
0B01:F7 EF DF BF 7F A5 6B F0 61
0B09:14 20 F7 12 A5 6A F0 0E 18
0B11:A5 67 18 69 03 85 67 A5 10
0B19:68 69 00 85 68 60 A5 67 8D
0B21:38 E9 01 85 67 A5 68 E9 D2
0B29:00 85 68 90 01 60 A9 00 93
0B31:85 67 85 68 A9 01 85 6A E1
0B39:60 A5 6B F0 1E A5 69 D0 90
0B41:03 4C F7 0B A5 61 18 65 E3
0B49:65 85 61 A5 62 65 66 85 F4
0B51:62 A5 62 C9 95 90 03 4C 2C
0B59:E3 0B 60 A9 00 8D E2 0B D1
0B61:AD 69 16 F0 01 60 EA BD 97
0B69:00 DC 8D E1 0B 20 63 17 3D
0B71:AD E1 0B 49 FF 29 04 F0 6A
0B79:16 A5 62 F0 12 A5 61 38 81
0B81:E9 64 85 61 A5 62 E9 00 F6
0B89:85 62 A9 01 8D E2 0B AD FB
0B91:E1 0B 49 FF 29 08 F0 18 E7
0B99:A5 62 C9 94 F0 12 A5 61 1A
0BA1:18 69 64 85 61 A5 62 69 D2
0BA9:00 85 62 A9 02 8D E2 0B 1F
0BB1:AD E1 0B 49 FF 29 10 F0 C2
0BB9:1F E6 6B A9 96 85 67 A9 64
0BC1:00 85 6A 85 68 85 66 AE B3
0BC9:E2 0B BD DB 0B 85 65 BD 80
0BD1:DE 0B 85 69 46 66 66 65 5F
0BD9:EA 60 00 32 32 00 00 01 33
0BE1:00 00 A9 94 85 62 A9 00 7F
0BE9:85 61 A9 00 85 69 46 66 15
0BF1:66 65 20 07 17 60 A5 61 EF
0BF9:38 E5 65 85 61 A5 62 E5 F6
0C01:66 85 62 A5 62 C9 FA B0 35
0C09:01 60 A9 00 85 61 85 62 0E
0C11:A9 01 85 69 46 66 66 65 83
0C19:20 07 17 60 A5 6B F0 17 BF
0C21:A5 6A F0 3D A5 63 18 65 E8
0C29:67 85 63 A5 64 65 68 85 2C
0C31:64 A5 64 C9 88 B0 01 60 77
0C39:A9 87 85 64 A9 00 85 63 BA
0C41:A9 00 85 6A 46 68 66 67 8D
0C49:A5 67 4A 4A 4A 4A 4A 4A 56
0C51:4A 05 68 85 6B 20 07 17 36
0C59:A5 65 05 66 F0 02 C6 65 27
0C61:60 A5 63 38 E5 67 85 63 3E
0C69:A5 64 E5 68 85 64 A5 64 1E
0C71:C9 FA B0 01 60 A9 00 85 82
0C79:63 85 64 A9 01 85 6A 46 05
0C81:68 66 67 20 07 17 60 A0 4C
0C89:10 B9 95 0C 99 00 D0 88 82
0C91:10 F7 60 00 00 00 00 00 BB
0C99:00 00 00 00 00 00 00 00 B1
0CA1:00 00 00 00 00 00 00 00 B9
0CA9:00 00 00 00 00 00 00 00 C1
0CB1:00 00 00 00 00 00 00 00 C9
0CB9:00 00 00 A2 0A BD A6 0C 9C
0CC1:95 61 CA 10 F8 20 E1 FF 63
0CC9:D0 06 A9 81 8D 0D DC 60 D3
0CD1:AD 8D 02 29 02 C9 02 D0 03
0CD9:1B AD 8D 02 29 02 C9 02 A3
0CE1:F0 F7 AD 8D 02 29 02 C9 81
0CE9:02 D0 F7 AD 8D 02 29 02 D9
0CF1:C9 02 F0 F7 EA AD 61 17 F4
0CF9:F0 0D CE 61 17 AD 61 17 07
0D01:D0 05 A9 80 8D 04 D4 A2 CA
0D09:00 20 06 0B 20 3A 0B 20 BC
0D11:1D 0C A2 00 20 06 0B 20 60
0D19:3A 0B 20 1D 0C A2 00 20 F3
0D21:06 0B 20 3A 0B 20 1D 0C C7
0D29:A2 00 20 31 11 A0 01 20 D8
0D31:50 0A 20 2A 0A A0 02 20 93
0D39:50 0A 20 2A 0A A2 0A B5 49
0D41:61 9D A6 0C CA 10 F8 A2 34
0D49:0A BD B1 0C 95 61 CA 10 A6
0D51:F8 A2 01 20 06 0B 20 3A 89
0D59:0B 20 1D 0C A2 01 20 06 C4
0D61:0B 20 3A 0B 20 1D 0C A2 31
0D69:01 20 06 0B 20 3A 0B 20 9D
0D71:1D 0C A2 01 20 31 11 A0 0A
0D79:03 20 50 0A 20 2A 0A A0 26
0D81:04 20 50 0A 20 2A 0A A2 B0
0D89:0A B5 61 9D B1 0C CA 10 7F
0D91:F8 20 11 08 20 88 0C 20 2E
0D99:2F 10 20 99 11 AD 69 16 15
0DA1:F0 18 AD BB 0C 0D B0 0C AD
0DA9:D0 10 8D 69 16 EE 3B 04 5F
0DB1:AD 3B 04 C9 B5 D0 03 4C D1
0DB9:6A 16 AD 2E 10 18 69 10 EA
0DC1:8D 2E 10 D0 06 20 AA 0F 52
0DC9:20 0C 16 4C BC 0C 20 F0 C5
0DD1:0D A0 00 A2 3C 20 E8 0D 06
0DD9:20 E8 0D 20 E8 0D CA CA BD
0DE1:CA CA CA CA 10 EF 60 BD D8
0DE9:00 CF 91 FB C8 E8 60 A0 35
0DF1:3F B1 FB 99 00 CF 88 10 91
0DF9:F8 60 20 F0 0D A0 00 B9 60
0E01:00 CF 48 B9 02 CF 99 00 38
0E09:CF 68 99 02 CF C8 C8 C8 76
0E11:C0 42 D0 EB A0 3F B9 00 6C
0E19:CF A2 07 4A 26 FD CA 10 1A
0E21:FA A5 FD 91 FB 88 10 EE 0E
0E29:60 00 00 00 00 00 00 00 75
0E31:64 00 03 CF 80 07 9E 00 3A
0E39:17 3C F0 17 39 F8 37 39 D4
0E41:F8 33 33 F0 13 33 C4 20 2B
0E49:00 1C 32 33 FC 13 39 F8 85
0E51:13 3C F0 07 3E 00 03 9F 2C
0E59:C0 00 CE 00 00 00 00 00 AF
0E61:00 00 00 00 00 00 00 00 7D
0E69:00 00 00 00 00 00 00 00 85
0E71:00 00 00 00 00 00 04 40 D5
0E79:00 08 80 00 02 20 00 03 3B
0E81:30 00 00 00 01 00 00 03 C0
0E89:00 F0 03 81 10 01 F9 E0 B3
0E91:00 F0 00 00 30 00 00 00 6B
0E99:00 00 00 00 00 FC 00 07 B0
0EA1:EE 00 06 0C 00 07 1F 80 91
0EA9:00 00 00 00 00 00 00 00 C5
0EB1:00 00 00 00 00 00 04 40 16
0EB9:00 08 80 00 02 20 00 03 7B
0EC1:30 00 00 00 01 00 00 03 01
0EC9:00 F0 03 81 10 03 E1 E0 CB
0ED1:01 F0 00 00 60 00 00 00 AD
0ED9:00 01 86 00 03 CE 00 07 61
0EE1:8E 00 03 07 E0 03 C7 80 39
0EE9:00 00 00 00 00 00 00 00 06
0EF1:00 00 00 00 00 00 04 40 56
0EF9:00 08 80 00 02 20 00 03 BB
0F01:30 00 00 00 01 00 00 03 42
0F09:00 F0 03 81 10 01 F9 E0 35
0F11:00 F0 00 00 30 00 00 00 EC
0F19:00 01 9E 00 00 E7 00 00 EA
0F21:E3 B8 00 C1 E0 01 F8 80 F8
0F29:00 00 00 00 00 00 00 00 47
0F31:00 00 00 3E 00 00 0E 04 53
0F39:00 00 0E 00 00 1D 00 1C A9
0F41:08 00 33 00 00 1B 00 00 36
0F49:06 00 00 00 00 21 80 00 EF
0F51:45 80 00 84 0C 00 C3 0C 6E
0F59:00 E0 20 04 C0 1C 0E 00 86
0F61:00 7C 00 00 00 00 00 00 9E
0F69:00 3F FF FF 13 14 AA 1C B1
0F71:C6 4A 0A A9 34 0B 14 C4 1C
0F79:0C AB 5C 05 44 64 06 AA CE
0F81:88 03 11 58 02 AA A8 02 5A
0F89:44 48 01 AA B0 01 AA B0 36
0F91:01 55 50 01 AA B0 01 65 1F
0F99:10 00 ED B0 00 92 40 00 53
0FA1:00 00 00 00 00 00 00 00 BF
0FA9:FF EA AE 94 0C A0 00 BD 42
0FB1:D0 0F 99 07 04 C8 E8 C0 75
0FB9:19 D0 F4 EE 94 0C AD 94 EA
0FC1:0C C9 3C F0 01 60 A9 00 CB
0FC9:8D 94 0C 20 B8 12 60 20 46
0FD1:20 20 20 20 20 20 20 20 EF
0FD9:20 20 20 20 20 20 20 20 F7
0FE1:20 20 20 20 20 20 20 20 FF
0FE9:20 20 20 20 20 04 12 09 64
0FF1:0E 0B 20 02 0C 15 05 20 DC
0FF9:10 0F 10 20 20 20 20 20 C9
1001:20 20 20 20 20 20 20 20 21
1009:20 20 20 20 20 20 20 20 29
1011:20 20 20 20 20 20 20 20 31
1019:20 20 20 20 20 20 20 20 39
1021:20 20 20 20 20 20 20 20 41
1029:20 20 20 20 20 00 AD 07 CA
1031:11 D0 3A EE 08 11 AE 08 2E
1039:11 E0 3C D0 0A AD 69 16 9E
1041:F0 3B A9 FF 8D 08 11 BD 4A
1049:CB 10 8D 07 11 BD 8F 10 24
1051:AA BD 1D 11 8D 07 D4 BD DA
1059:09 11 8D 08 D4 A9 69 8D 22
1061:0C D4 A9 56 8D 0D D4 A9 4B
1069:11 8D 0B D4 60 CE 07 11 81
1071:AD 07 11 C9 03 D0 F5 A9 D9
1079:10 8D 0B D4 60 A9 3B 8D 61
1081:08 11 A9 00 8D 07 D4 8D DE
1089:08 D4 8D 07 11 60 06 01 1C
1091:13 00 01 02 00 03 02 04 8F
1099:03 05 03 02 00 00 01 06 05
10A1:00 03 06 04 03 05 04 03 BA
10A9:07 03 03 03 03 07 01 03 D7
10B1:03 03 03 03 07 06 03 11 0C
10B9:00 01 06 03 08 03 08 09 70
10C1:05 03 07 03 12 04 08 07 ED
10C9:03 06 10 10 10 10 08 18 D8
10D1:10 10 08 18 10 20 10 08 A9
10D9:40 10 08 18 10 10 08 18 89
10E1:10 20 10 08 40 10 10 10 07
10E9:10 10 08 28 10 10 10 10 8A
10F1:10 08 28 08 08 08 08 08 1A
10F9:10 08 10 08 18 10 08 08 BF
1101:08 08 08 08 08 18 00 FF 4B
1109:10 12 15 19 1C 21 13 16 8D
1111:1D 1F 23 38 3B 2C 32 27 87
1119:25 0E 1A 11 C3 D1 1F 1E 67
1121:31 87 EF 60 DF A5 86 63 C7
1129:BE C1 3C DF A2 EF 9C C3 72
1131:8A 0A AA A5 6B D0 37 AD 85
1139:E2 0B 29 01 49 01 F0 17 0C
1141:A5 62 4A 4A 29 03 D0 03 B6
1149:18 69 01 18 69 E3 9D F9 83
1151:07 A9 E0 9D FA 07 60 A5 B1
1159:62 4A 4A 29 03 D0 03 18 94
1161:69 01 18 69 E6 9D F9 07 BA
1169:A9 E1 9D FA 07 60 AD E2 34
1171:0B 29 01 49 01 F0 1B A5 BF
1179:62 49 FF 4A 4A 29 03 18 D8
1181:69 EC 9D F9 07 A5 62 4A C4
1189:4A 29 03 18 69 E0 9D FA 02
1191:07 60 A5 62 4C 7C 11 60 01
1199:AD A9 0C 18 69 10 38 ED E9
11A1:B4 0C 90 F3 29 E0 D0 EF D0
11A9:AD A7 0C 18 69 08 38 ED 59
11B1:B2 0C 90 E3 29 F0 D0 DF 0F
11B9:20 B3 16 AD A9 0C CD B4 44
11C1:0C B0 03 4C 29 12 A9 00 20
11C9:8D BA 0C 8D B8 0C 20 F6 E8
11D1:16 8D B7 0C AD A7 0C 18 56
11D9:69 08 38 ED B2 0C 29 0F BF
11E1:4A AA BD 8E 12 85 FB BD D0
11E9:96 12 85 FC AD B9 0C D0 99
11F1:03 20 17 12 AD B5 0C 18 16
```

```
11F9:65 FB 8D B5 0C AD B6 0C 6B
1201:65 FC 8D B6 0C 10 09 20 07
1209:17 12 A9 00 8D B9 0C 60 3E
1211:A9 01 8D B9 0C 60 A9 00 CC
1219:38 ED B5 0C 8D B5 0C A9 51
1221:00 ED B6 0C 8D B6 0C 60 18
1229:A9 00 8D AF 0C 8D AD 0C CC
1231:8D AF 0C 20 F6 16 8D AC 63
1239:0C AD B2 0C 18 69 07 38 92
1241:ED A7 0C 29 0F 4A AA BD 0F
1249:8E 12 85 FB BD 96 12 85 9B
1251:FC AD AE 0C D0 03 20 7C 45
1259:12 AD AA 0C 18 65 FB 8D E3
1261:AA 0C AD AB 0C 65 FC 8D CB
1269:AB 0C 10 09 20 7C 12 A9 B9
1271:00 8D AE 0C 60 A9 01 8D C8
1279:AE 0C 60 A9 00 38 ED AA 06
1281:0C 8D AA 0C A9 00 ED AB F9
1289:0C 8D AB 0C 60 1B 09 03 D1
1291:01 FE FC F6 E4 00 00 00 2C
1299:00 FF FF FF FF 2D 08 2D AF
12A1:08 50 08 73 08 60 18 7D 85
12A9:18 A8 18 2D 08 83 08 A0 D8
12B1:08 C6 08 ED 08 0B 09 A2 8C
12B9:53 A9 20 9D D0 0F CA 10 38
12C1:FA AD E8 12 0A AA BD 9E 22
12C9:12 85 FB BD 9F 12 85 FC 01
12D1:A0 00 B1 FB F0 07 99 EE 02
12D9:0F C8 4C D3 12 AE E8 12 AD
12E1:BD E9 12 8D E8 12 60 00 CA
12E9:09 02 08 03 01 06 01 0C 72
12F1:09 0A 0B 0C 01 60 8E D0 B6
12F9:13 A5 6A F0 F8 A5 64 4A DE
1301:C9 1C D0 F1 A2 02 8E D1 58
1309:13 AE D1 13 BD DA 13 18 67
1311:69 08 38 E5 62 85 FB 90 05
1319:39 29 F0 D0 35 20 07 17 A0
1321:A5 FB 4A A8 B9 D2 13 85 B1
1329:69 E6 65 A5 65 4A 4A 05 B2
1331:66 F0 0D A5 65 38 E9 01 A3
1339:85 65 A5 66 E9 00 85 66 57
1341:46 68 66 67 46 68 66 67 EF
1349:A5 67 05 68 F0 11 A9 00 62
1351:85 6A AE D1 13 CE D1 13 52
1359:CA 10 AE AE D0 13 60 20 5D
1361:42 17 A9 00 85 65 85 66 D6
1369:E6 64 E6 64 AE D0 13 FE 1D
1371:CE 13 FE CE 13 FE CC 13 D1
1379:FE CC 13 BD CC 13 C9 BA 91
1381:D0 1C A9 B0 9D CC 13 FE 9C
1389:CA 13 BD CA 13 C9 BA D0 44
1391:0D A9 B0 9D CA 13 FE C8 02
1399:13 A9 04 8D E8 12 AD C8 C0
13A1:13 8D 82 04 AD CA 13 8D 91
13A9:83 04 AD CC 13 8D 84 04 F0
13B1:AD C9 13 8D 92 04 AD CB 28
13B9:13 8D 93 04 AD CD 13 8D D7
13C1:94 04 A9 01 4C 51 13 B0 F6
13C9:B0 B0 B0 B0 B0 00 00 00 1B
13D1:00 01 00 00 00 01 01 01 3F
13D9:00 03 47 8F A9 43 A2 25 67
13E1:9D 09 06 9D C1 07 9D 81 9A
13E9:06 9D 49 07 CA 10 F1 A9 38
13F1:20 A2 14 9D 89 06 9D 51 1E
13F9:07 CA 10 F7 A9 A0 A2 18 05
1401:9D 2F 04 9D 57 04 9D 7F A3
1409:04 CA 10 F4 A2 0A A9 79 41
1411:9D AE 04 A9 E2 9D 9E 05 9E
1419:CA 10 F3 A9 40 A2 04 9D F5
1421:01 05 9D 79 05 CA 10 F7 C1
1429:A2 02 9D BA 06 9D 32 07 94
1431:CA 10 F7 20 26 15 A2 00 8E
1439:BD 57 14 A8 BD 58 14 85 20
1441:FB BD 59 14 85 FC 05 FB 69
1449:F0 0B 98 A0 00 91 FB E8 F0
1451:E8 E8 4C 39 14 60 5F 05 2B
1459:04 DF 06 04 5F 2E 04 5F 97
1461:57 04 20 7F 04 5F 80 04 D4
1469:69 21 04 69 48 04 69 6F 3A
1471:04 69 96 04 6C A0 04 6C 63
1479:AD 04 7B B9 04 7B C7 04 26
1481:70 00 05 6E 06 05 6D 78 01
1489:05 7D 7E 05 5D 28 05 5D A6
1491:50 05 5D 2E 05 5D 56 05 01
1499:63 7B 05 7C 9D 05 7C A4 59
14A1:05 20 A3 05 40 E3 06 40 F6
14A9:0B 07 7E A2 05 7C A4 05 7B
14B1:7E A9 05 70 09 06 72 1B 8B
14B9:06 6E 2E 06 93 5A 04 81 36
14C1:5B 04 8D 5C 04 85 6A 04 1F
14C9:84 6B 04 71 BB 06 55 B9 01
14D1:06 49 BD 06 55 E2 06 49 F2
14D9:E4 06 4A 0A 07 4B 0C 07 64
14E1:4A 31 07 72 33 07 4B 35 05
14E9:07 6B 49 07 7D 51 07 6D B6
14F1:65 07 73 6E 07 6D C1 07 5C
14F9:5D E1 06 5D 09 07 5D E5 E4
1501:06 5D 0D 07 71 D3 07 7D FD
1509:E6 07 6B 81 06 6E 89 06 F0
1511:70 9D 06 20 97 04 E9 20 5E
1519:04 73 A6 06 20 7A 05 20 6C
1521:7C 05 00 00 00 A2 00 A9 FE
1529:A0 9D C8 04 9D EF 04 8A A3
1531:18 69 28 AA E0 F0 D0 EF CD
1539:A2 00 A9 76 9D D5 04 8A 28
1541:18 69 28 AA E0 C8 D0 F2 40
1549:A2 00 A9 75 9D E1 04 A9 77
1551:E1 9D 7F 06 9D DF 05 A9 44
1559:61 9D B8 05 9D 58 06 8A E7
1561:18 69 28 AA E0 C8 D0 E2 50
1569:A2 00 A9 5D 9D 09 06 9D AA
1571:F9 06 9D 89 06 9D 1B 06 49
1579:9D 0B 07 9D 9D 06 9D 2E 5E
1581:06 9D 1E 07 8A 18 69 28 F9
1589:AA E0 F0 D0 DD A9 00 8D 8F
1591:20 D0 8D 21 D0 85 C6 A2 90
1599:0D BD 52 18 9D 0D 04 CA 79
15A1:10 F7 60 A9 06 A2 9F 9D 10
15A9:00 D8 CA E0 FF D0 F8 A9 50
15B1:00 A2 C7 9D A0 D8 9D 68 63
15B9:D9 CA E0 FF D0 F5 A2 EF 33
15C1:A9 0C 9D 08 DA 9D F8 DA 12
15C9:CA E0 FF D0 F5 A2 00 A9 82
15D1:00 9D 08 DA 9D A8 DA 9D F4
15D9:2F DA 9D CF DA 8A 18 69 9D
15E1:28 AA E0 C8 D0 E9 A9 02 F6
15E9:A2 18 9D 07 D8 CA 10 FA 9C
15F1:A9 00 8D 3B D8 A2 04 9D 4D
15F9:59 D8 9D 69 D8 CA 10 F7 5B
1601:A2 04 A9 02 9D 89 D8 CA 64
1609:10 FA 60 AD 69 16 D0 3F 67
1611:CE 8D 04 AD 8D 04 C9 AF 23
1619:D0 35 A9 B9 8D 8D 04 CE 45
1621:8C 04 AD 8C 04 C9 AF D0 8A
1629:26 A9 B5 8D 8C 04 CE 8A FE
1631:04 AD 8A 04 C9 AF D0 17 22
1639:A9 B9 8D 8A 04 CE 89 04 75
1641:AD 89 04 C9 AF D0 08 20 B4
1649:51 16 A9 01 8D 69 16 60 87
1651:A9 B1 8D 89 04 A9 B0 8D BE
1659:8A 04 A9 B0 8D 8C 04 8D 40
1661:8D 04 A9 BA 8D 8B 04 60 39
1669:00 A9 00 8D 00 D4 8D 01 48
1671:D4 8D 07 D4 8D 08 D4 8D 5D
1679:0E D4 8D 0F D4 A9 B4 8D C8
1681:3B 04 AD CE 13 CD CF 13 71
1689:D0 08 A9 03 8D E8 12 4C 06
1691:BB 0D A0 07 A9 00 85 C6 82
1699:A2 FF 20 11 08 A5 C6 D0 61
16A1:0E CA D0 F6 88 D0 F1 A9 26
16A9:00 8D 00 D4 8D 01 D4 4C EC
16B1:25 09 AD B0 0C 0D BB 0C 8B
16B9:F0 42 AD 61 17 D0 35 A9 CA
16C1:8F 8D 18 D4 A9 10 8D 05 17
16C9:D4 8D 13 D4 A9 64 8D 06 73
16D1:D4 A9 5A 8D 14 D4 A9 10 4E
16D9:8D 12 D4 A9 15 8D 04 D4 42
16E1:A9 18 8D 01 D4 A9 0D 8D 9F
16E9:0F D4 A9 14 8D 04 D4 A9 19
16F1:10 8D 12 D4 60 A9 C8 AE 03
16F9:69 16 D0 01 60 EE AA 0C AA
1701:EE B5 0C A9 A0 60 AD 61 73
1709:17 D0 E9 A9 8F 8D 18 D4 86
1711:A9 10 8D 05 D4 8D 13 D4 F1
1719:A9 64 8D 06 D4 A9 5A 8D D6
1721:14 D4 A9 10 8D 12 D4 A9 CC
1729:15 8D 04 D4 A9 10 8D 01 BC
1731:D4 A9 05 8D 0F D4 A9 10 DC
1739:8D 04 D4 A9 10 8D 12 D4 14
1741:60 A9 0F 8D 18 D4 A9 77 A3
1749:8D 05 D4 A9 77 8D 06 D4 87
1751:A9 28 8D 01 D4 A9 81 8D FD
1759:04 D4 A9 05 8D 61 17 60 C4
1761:00 60 AD 00 18 F0 FA AD 85
1769:B0 0C F0 05 AD AF 0C F0 96
1771:F0 E0 00 F0 EC AD 01 18 97
1779:F0 0F CE 01 18 AD 03 18 63
1781:8D E1 0B 20 05 18 4C 62 D5
1789:17 8E 02 18 A2 02 E0 01 88
1791:F0 5E BD DA 13 18 69 08 09
1799:38 E5 62 85 FB 90 10 29 6D
17A1:F0 D0 0C 20 C6 17 AE 02 F1
17A9:18 A9 41 8D 01 18 60 CA 43
17B1:10 DC AE 02 18 AD A7 0C E7
17B9:CD B2 0C 90 04 20 D5 17 69
17C1:60 20 E3 17 60 BD D2 17 CC
17C9:8D 03 18 A9 14 8D 01 18 0E
17D1:60 17 00 1B A9 2D 8D 01 C5
17D9:18 A9 17 8D 03 18 20 05 F7
17E1:18 60 A9 2D 8D 01 18 A9 86
17E9:1B 8D 03 18 20 05 18 60 90
17F1:AD A7 0C CD DB 13 D0 B7 C3
17F9:A9 64 8D 01 18 D0 B0 01 3E
1801:00 00 00 00 AD A7 0C 38 8D
1809:ED B2 0C C9 14 F0 05 C9 33
1811:EB F0 01 60 AD AF 0C F0 CE
1819:20 AD A9 0C C9 32 90 19 0C
1821:AD A7 0C CD B2 0C 90 07 5E
1829:A9 07 8D E1 0B D0 05 A9 0F
1831:0B 8D E1 0B A9 00 8D 01 A0
1839:18 60 20 E4 FF C9 31 F0 5A
1841:0A C9 32 D0 F5 A9 00 8D 20
1849:00 18 60 A9 01 8D 00 18 7C
1851:60 31 20 10 0C 01 19 05 9E
1859:12 20 0F 12 20 32 3F 12 F7
1861:2E 20 01 0E 04 05 12 13 1D
1869:0F 0E 20 26 20 04 2E 20 98
1871:08 05 0E 13 0C 05 19 20 A0
1879:0A 12 2E 00 03 0F 10 19 86
1881:12 09 07 08 14 20 31 39 1B
1889:38 37 20 03 0F 0D 10 15 B9
1891:14 05 21 20 10 15 02 0C 18
1899:09 03 01 14 09 0F 0E 13 24
18A1:2C 20 09 0E 03 2E 00 01 C3
18A9:0C 0C 20 12 09 07 08 14 90
18B1:13 20 12 05 13 05 12 16 EC
18B9:05 04 00 00 00 00 00 00 6D
```

Program 2: Basketball Sam & Ed Customizer Loader

```
SF 10 POKE 53280,0:POKE 53281,
      0
JC 20 PRINT"{CLR}{2 DOWN}{BLK}
      LOAD"CHR$(34)"SAM & ED"C
      HR$(34)",8"
AA 30 PRINT"{4 DOWN}POKE 44,10
      0:POKE 25600,0"
DK 40 PRINT"{2 DOWN}LOAD"CHR$(
      34)"S & E CUSTOMIZER"CHR
      $(34)",8"
DX 50 PRINT"{4 DOWN}RUN"
GB 60 PRINTSPC(2)"{83}JUST A MO
      MENT ... LOADING CUSTOMI
      ZER{BLK}{HOME}";
DX 70 FORI=1TO4:POKE630+I,13:N
      EXT:POKE198,I
```

Program 3: Basketball Sam & Ed Customizer

```
FG 10 REM SAM & ED CUSTOMIZER
MX 20 REM COPYRIGHT 1987 - COM
      PUTE! PUBLICATIONS, INC.
       ALL RIGHTS RESERVED
RC 30 POKE 53280,2:POKE 53281,
      12:BK=1
AK 40 GOSUB 550
MA 50 PRINT"{DOWN}CHANGE COLOR
      S (Y/N)";:INPUT A$:IF A$
      <>"Y" THEN 230
CK 60 PRINT"{DOWN}{3 RIGHT}PRE
      SS SPACEBAR TO CHOOSE CO
```

```
      LORS"
KG 70 PRINT"{3 RIGHT}AND THEN
      {SPACE}PRESS RETURN TO S
      ELECT"
HQ 80 PRINT"{DOWN}BORDER COLOR
      {5 SPACES}";:GOSUB 600
GR 90 BD=X:POKE 53280,X
RM 100 PRINT"BACKGROUND COLOR
      {SPACE}";:GOSUB 600
HA 110 BK=X:POKE 53281,X:IF BK
      =0 THEN POKE 646,1
FC 120 PRINT"{DOWN}SAM'S BODY
      {SPACE}COLOR ";:GOSUB 6
      00
RB 130 SB=X
EM 140 PRINT"SAM'S LEG COLOR
      {2 SPACES}";:GOSUB 600
HF 150 SL=X
DX 160 PRINT"{DOWN}ED'S BODY C
      OLOR{2 SPACES}";:GOSUB
      {SPACE}600
FA 170 EB=X
JJ 180 PRINT"ED'S LEG COLOR
      {3 SPACES}";:GOSUB 600
XF 190 EL=X
MG 200 POKE 2431,BD:POKE 2441,
      BK
EE 210 POKE 2461,SL:POKE 2466,
      SB
SH 220 POKE 2471,EL:POKE 2476,
      EB
JP 230 POKE 53280,2:POKE 53281
      ,12:POKE 646,0
KG 240 GOSUB 550:PRINT"{DOWN}C
      HANGE TIMER (Y/N)";:INP
      UT D$:IF D$="Y" THEN GO
      SUB 690
SS 250 GOSUB 550:PRINT"{DOWN}C
      HANGE MESSAGES (Y/N)";:
      INPUT A$:IF A$<>"Y" THE
      N 450
QD 260 GOSUB550
DH 270 PRINT"{DOWN}UPCOMING EV
      ENT #1 (37 CHARS MAX.)"
      :INPUT A$
XS 280 IF LEN(A$)<37 THEN A$=A
      $+" ":GOTO 280
AF 290 A$=LEFT$(A$,37)
SA 300 FOR Y=1 TO 37:NC=ASC(MI
      D$(A$,Y,1)):IF NC>63 TH
      EN NC=NC-64
XC 310 POKE 2207+Y,NC
AB 320 NEXT Y
DC 330 PRINT"{DOWN}UPCOMING EV
      ENT #2 (37 CHARS MAX.)"
      :INPUT A$
FQ 340 IF LEN(A$)<38 THEN A$=A
      $+" ":GOTO 340
SK 350 A$=LEFT$(A$,38)
BR 360 FOR Y=1 TO 38:NC=ASC(MI
      D$(A$,Y,1)):IF NC>63 TH
      EN NC=NC-64
FE 370 POKE 2245+Y,NC
JG 380 NEXT Y
EM 390 PRINT"{DOWN}UPCOMING EV
      ENT #3 (29 CHARS MAX.)"
      :INPUT A$
KJ 400 IF LEN(A$)<29 THEN A$=A
      $+" ":GOTO 400
ER 410 A$=LEFT$(A$,29)
PK 420 FOR Y=1 TO 29:NC=ASC(MI
      D$(A$,Y,1)):IF NC>63 TH
      EN NC=NC-64
PK 430 POKE 2284+Y,NC
FK 440 NEXT Y
XH 450 PRINT"{2 DOWN}{6 RIGHT}
      INSERT A NEW FORMATTED
      {SPACE}DISK":FOR D=1 TO
       1000:NEXT
QP 460 PRINT"{DOWN}{RVS}
      {2 SPACES}PRESS ANY KEY
       TO SAVE CUSTOM SAM & E
      D {OFF}"
KR 470 GET DH$
FE 480 IF DH$="" THEN 470
XJ 490 POKE 44,8:POKE 46,25
JQ 500 PRINT"{DOWN}JUST A MOME
      NT..."
MC 510 PRINT"SAVING CUSTOM SAM
       & ED"
MG 520 OPEN 1,8,15,"S0:CUSTOM
      {SPACE}SAM & ED":CLOSE
      {SPACE}1
HH 530 SAVE"CUSTOM SAM & ED",8
JM 540 PRINT"{CLR}{DOWN}{RVS}
      {6 SPACES}PRESS RETURN
      {SPACE}TO PLAY SAM & ED
      {5 SPACES}{OFF}":PRINT"
      {3 DOWN}RUN{3 UP}":END
DX 550 PRINT"{CLR}{BLK}";:PRIN
      TSPC(9)"{RVS}{2 SPACES}
      SAM & ED CUSTOMIZER
      {2 SPACES}{OFF}"
JQ 560 FOR M=1 TO 10:PRINT"
      {DOWN}":NEXT
SD 570 PRINTSPC(5)"UDI COPYRIG
      HT 1987"
QD 580 PRINTSPC(5)"GCH COMPUTE
      ↓ PUBLICATIONS INC."
FC 590 PRINTSPC(5)"JFK ALL RIG
      HTS RESERVED{HOME}":RET
      URN
SM 600 FOR X=0 TO 15
BC 610 POKE 646,X:PRINT"{RVS}
      {SPACE}{OFF}";"{LEFT}";
      :GET A$:IF A$=CHR$(13)
      {SPACE}THEN POKE 646,0:
      GOTO 670
GA 620 IF A$=CHR$(32) THEN 640
QP 630 GOTO 610
FJ 640 IF X=15 THEN 600
RM 650 NEXT
JR 660 GOTO 610
MM 670 PRINT:IF BK=0 THEN POKE
       646,1
JA 680 RETURN
JQ 690 PRINT"{DOWN}ENTER A NUM
      BER LESS THAN 10";:INPU
      T H$
QJ 700 IF H$="" THEN 700
SJ 710 H=VAL(H$)+176
SJ 720 POKE 5714,176:POKE 5719
      ,H:RETURN
```

Squeeze

See instructions in article on page 55 before typing in.

```
C000:0E A8 00 3A AA 00 EA AA 2C
C008:80 EA 3A 80 E8 0E 80 E8 3D
C010:0E 80 E8 0E 80 E8 0E 80 FA
C018:E8 0E 80 E8 0E 80 E8 0E 82
C020:80 E8 0E 80 EA 3A 80 EA 12
C028:AA 80 3A AA 00 0E A8 00 9A
C030:00 00 00 00 00 00 00 00 B1
C038:00 00 00 00 00 00 00 00 B9
C040:03 A0 00 0E A0 00 0E A0 0E
C048:00 3A A0 00 3A A0 00 03 C3
C050:A0 00 03 A0 00 03 A0 00 D9
C058:03 A0 00 03 A0 00 03 A0 5F
C060:00 03 A0 00 03 A0 00 3A 8B
C068:AA 00 3A AA 00 3A AA 00 6F
C070:00 00 00 00 00 00 00 00 F1
C078:00 00 00 00 00 00 00 3A 34
C080:0E A8 00 3A AA 00 EA AA AC
C088:80 EA 3A 80 E8 0E 80 E8 BD
C090:0E 80 00 0E 80 00 EA 80 74
C098:03 AA 00 0E A8 00 3A A0 81
C0A0:00 EA 80 00 EA 00 00 EA 2F
C0A8:AA 80 EA AA 80 EA AA 80 2D
C0B0:00 00 00 00 00 00 00 00 32
C0B8:00 00 00 00 00 00 00 E5 20
C0C0:0E A8 00 3A AA 00 EA AA EC
C0C8:80 EA 3A 80 E8 0E 80 E8 FD
C0D0:0E 80 00 3A 80 00 EA 00 F6
C0D8:00 EA 00 00 3A 80 E8 0E C8
C0E0:80 E8 0E 80 EA 3A 80 EA D2
C0E8:AA 80 3A AA 00 0E A8 00 5B
C0F0:00 00 00 00 00 00 00 00 72
C0F8:00 00 00 00 00 00 00 20 9A
C100:00 EA 00 00 EA 00 03 AA 46
C108:00 03 AA 00 0E AA 00 0E CA
C110:BA 00 3A 3A 00 3A 3A 00 39
C118:EA 3A 00 EA AA 80 EA AA 26
C120:80 EA AA 80 00 EA 00 00 A7
C128:EA 00 03 AA 80 03 AA 80 12
C130:00 00 00 00 00 00 00 00 B3
C138:00 00 00 00 00 00 00 00 BB
C140:EA AA 00 EA AA 00 EA AA 68
C148:00 EA 00 00 EA 00 00 EA C8
C150:00 00 EA A8 00 EA AA 00 BC
C158:EA 3A 80 00 0E 80 00 0E 70
C160:80 E8 0E 80 EA 3A 80 EA 54
C168:AA 80 3A AA 00 0E A8 00 DC
C170:00 00 00 00 00 00 00 00 F3
C178:00 00 00 00 00 00 00 3A 36
C180:0E A8 00 3A AA 00 EA 3A 3E
C188:80 E8 0E 80 E8 0E 80 E8 B9
C190:00 00 EA A8 00 EA AA 00 FC
C198:EA 3A 80 E8 0E 80 E8 0E 11
C1A0:80 E8 0E 80 EA 3A 80 EA 94
C1A8:AA 80 3A AA 00 0E A8 00 1D
C1B0:00 00 00 00 00 00 00 00 34
C1B8:00 00 00 00 00 00 00 D5 12
C1C0:EA AA 80 EA AA 80 EA AA FA
C1C8:80 E8 3A 80 E8 3A 80 00 47
C1D0:EA 00 00 EA 00 03 A8 00 D5
C1D8:03 A8 00 0E A0 00 0E A0 AA
C1E0:00 0E A0 00 0E A0 00 0E FC
C1E8:A0 00 0E A0 00 0E A0 00 02
C1F0:00 00 00 00 00 00 00 00 74
C1F8:00 00 00 00 00 00 00 10 8C
C200:0E A8 00 3A AA 00 EA AA 30
C208:80 EA 3A 80 E8 0E 80 E8 41
C210:0E 80 EA 3A 80 3A AA 00 FF
C218:3A AA 00 EA 3A 80 E8 0E C7
C220:80 E8 0E 80 EA 3A 80 EA 16
C228:AA 80 3A AA 00 0E A8 00 9E
C230:00 00 00 00 00 00 00 00 B5
C238:00 00 00 00 00 00 00 00 BD
C240:0E A8 00 3A AA 00 EA AA 70
C248:80 EA 3A 80 E8 0E 80 E8 81
C250:0E 80 E8 0E 80 EA 3A 80 9F
C258:3A AA 80 0E AA 80 00 0E FB
C260:80 E8 0E 80 E8 0E 80 EA 95
C268:3A 80 3A AA 00 0E A8 00 A6
C270:00 00 00 00 00 00 00 00 F5
C278:00 00 00 00 00 00 00 3A 38
C280:00 00 00 00 00 00 00 00 06
C288:00 00 00 00 00 82 00 00 18
C290:28 00 00 82 00 02 14 80 03
C298:00 14 00 00 82 00 00 00 37
C2A0:00 00 00 00 00 00 00 00 26
C2A8:00 00 00 00 00 00 00 00 2E
C2B0:00 00 00 00 00 00 00 00 36
C2B8:00 00 00 00 00 00 00 00 3E
C2C0:00 00 00 00 00 00 00 00 46
C2C8:00 00 00 00 00 82 00 00 58
C2D0:28 00 02 82 80 00 14 00 FE
C2D8:00 94 00 02 08 00 00 00 E3
C2E0:00 00 00 00 00 00 00 00 66
C2E8:00 00 00 00 00 00 00 00 6E
C2F0:00 00 00 00 00 00 00 00 76
C2F8:00 00 00 00 00 00 00 00 7E
C300:00 00 00 00 00 00 00 00 87
C308:00 00 00 00 00 82 00 00 99
C310:28 00 00 82 00 02 14 80 84
C318:00 14 00 00 82 00 00 00 B8
C320:00 00 00 00 00 00 00 00 A7
C328:00 00 00 00 00 00 00 00 AF
C330:00 00 00 00 00 00 00 00 B7
C338:00 00 00 00 00 00 00 00 BF
C340:00 00 00 00 00 00 00 00 C7
C348:00 00 00 00 00 82 00 00 D9
C350:28 00 02 82 80 00 14 00 80
C358:00 16 00 00 20 80 00 00 68
C360:00 00 00 00 00 00 00 00 E7
C368:00 00 00 00 00 00 00 00 EF
```

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C370:00 00 00 00 00 00 00 00 F7
C378:00 00 00 00 00 00 00 3B 3B
C380:0A 03 02 09 0E 08 07 00 3D
C388:A9 00 85 11 85 12 A0 00 5C
C390:B9 00 C0 99 00 64 B9 00 AB
C398:C1 99 00 65 B9 00 C2 99 AA
C3A0:00 66 B9 00 C3 99 00 67 E4
C3A8:C8 D0 E5 A0 00 A9 04 99 D7
C3B0:00 D8 99 00 D9 99 00 DA B1
C3B8:99 00 DB A9 DB 99 00 60 C8
C3C0:99 00 61 99 00 62 99 00 97
C3C8:63 C8 D0 E1 A9 AA 99 00 97
C3D0:40 99 00 41 C8 D0 F7 99 06
C3D8:00 42 C8 C0 80 D0 F8 A9 F8
C3E0:00 8D 21 D0 A9 0B 8D 20 B1
C3E8:D0 AD 00 DD 29 FC 09 02 73
C3F0:8D 00 DD AD 18 D0 29 07 33
C3F8:09 80 8D 18 D0 AD 11 D0 88
C400:09 20 8D 11 D0 AD 16 D0 13
C408:09 10 8D 16 D0 A9 90 8D 09
C410:F8 63 8D F9 63 8D FA 63 EA
C418:8D FB 63 A9 32 8D 01 D0 09
C420:8D 03 D0 8D 05 D0 8D 07 B1
C428:D0 A9 5E 8D 00 D0 18 69 06
C430:16 8D 02 D0 A9 E8 8D 04 85
C438:D0 18 69 16 8D 06 D0 A9 8E
C440:05 8D 27 D0 8D 28 D0 A9 F9
C448:04 8D 29 D0 8D 2A D0 A9 C9
C450:00 8D 26 D0 85 13 A9 FF DA
C458:8D 1C D0 8D 15 D0 A9 0F F0
C460:8D 18 D4 A9 7F 8D 0D DC 15
C468:A9 FF 8D 00 DC A9 C1 8D 17
C470:18 03 20 B7 C4 A0 00 B9 A8
C478:00 DC 29 10 F0 07 C8 C0 55
C480:02 90 F4 B0 F0 78 A9 A9 3F
C488:8D 14 03 A9 C4 8D 15 03 62
C490:A9 C1 8D 18 03 A9 50 8D 7F
C498:12 D0 AD 11 D0 29 7F 8D DD
C4A0:11 D0 A9 01 8D 1A D0 58 FA
C4A8:60 20 EA FF A9 01 8D 19 4D
C4B0:D0 68 A8 68 AA 68 40 A9 79
C4B8:9A 8D FC 63 8D FD 63 A9 9D
C4C0:8C 8D 09 D0 8D 0B D0 A9 06
C4C8:66 8D 08 D0 A9 EE 8D 0A 25
C4D0:D0 A9 05 8D 2B D0 A9 02 98
C4D8:8D 2C D0 A9 01 8D 25 D0 42
C4E0:A9 80 85 FB A9 42 85 FC 2E
C4E8:A2 1D A0 00 A9 00 91 FB 8B
C4F0:C8 D0 FB E6 FC CA D0 F6 AC
C4F8:A9 58 85 04 A9 E0 85 06 40
C500:A9 4F 85 05 85 07 A9 00 D0
C508:85 17 85 18 85 1B 85 1C 0E
C510:85 22 85 27 85 29 8D 10 06
C518:D0 A9 50 85 1F A9 F0 85 DF
C520:20 85 14 85 15 A9 0B 85 E2
C528:1D A9 1C 85 1E A9 0A 85 B9
C530:19 85 1A A9 78 85 21 A9 4D
C538:DC 85 23 A9 0E 85 24 85 E6
C540:25 A9 02 85 28 A9 01 85 D0
C548:2A A9 00 A8 99 00 D4 C8 1D
C550:C0 17 D0 F8 A8 AA 20 DB B7
C558:FF A9 61 8D 00 D4 A9 F0 EA
C560:8D 06 D4 A9 10 8D 0F D4 13
C568:A9 29 8D 01 D4 60 20 90 CD
C570:C3 E6 29 A5 29 C5 2A 90 5C
C578:09 A9 00 85 29 A9 23 8D 0F
C580:04 D4 20 05 C6 E6 27 A5 5D
C588:27 C5 28 90 09 A9 00 85 9B
C590:27 A9 20 8D 04 D4 A5 21 D6
C598:A8 AA CA D0 FD 88 D0 FA 38
C5A0:A5 13 49 02 85 13 AD 25 06
C5A8:D0 18 69 01 29 0F F0 F9 41
C5B0:8D 25 D0 A0 02 B9 FB 63 C2
C5B8:18 69 01 C9 9E 90 02 A9 4C
C5C0:9A 99 FB 63 88 D0 EE 20 3B
C5C8:DE FF E0 04 90 A3 E0 08 FC
C5D0:B0 09 A9 12 8D 0F D4 A9 49
C5D8:40 D0 25 E0 0C B0 09 A9 4A
C5E0:17 8D 0F D4 A9 18 D0 18 F1
C5E8:E0 10 B0 85 A9 00 8D 0F CE
C5F0:D4 A9 04 85 28 A9 02 85 9B
C5F8:2A A9 21 8D 01 D4 A9 08 B7
C600:85 21 4C 71 C5 A5 13 D0 F4
C608:2A A9 00 85 22 A5 04 85 A2
C610:02 A5 05 85 03 A5 14 85 5D
C618:08 A5 17 85 0C A5 19 85 FC
C620:0D A5 1B 85 0F A5 1D 85 28
C628:10 A5 1F 85 0A A5 24 85 18
C630:26 D0 28 A9 01 85 22 A5 AC
C638:06 85 02 A5 07 85 03 A5 BE
C640:15 85 08 A5 18 85 0C A5 A9
C648:1A 85 0D A5 1C 85 0F A5 FA
C650:1E 85 10 A5 20 85 0A A5 7B
C658:25 85 26 A0 00 B1 22 29 DC
C660:0F C9 0F F0 02 85 26 B1 FC
C668:22 29 10 F0 04 A9 01 D0 FB
C670:02 A9 00 85 0B A5 26 48 45
C678:29 01 D0 03 20 9D C6 68 92
C680:48 29 02 D0 03 20 53 C7 D0
C688:68 48 29 04 D0 03 20 A3 38
C690:C7 68 29 08 D0 03 20 27 BB
C698:C8 20 EB C6 60 A4 13 C6 FE
C6A0:0C F0 24 E6 0C E6 0C A5 1D
C6A8:0D 38 E9 01 90 26 85 0D 4D
C6B0:A5 02 38 E9 3C 85 02 A5 D8
C6B8:03 E9 01 85 03 B9 09 D0 9C
C6C0:38 E9 04 99 09 D0 60 A5 F0
C6C8:02 38 E9 04 85 02 B0 ED 66
C6D0:C6 03 D0 E9 A9 16 85 0D F8
C6D8:A5 02 18 69 84 85 02 A5 37
C6E0:03 69 1B 85 03 A9 F0 99 40
C6E8:09 D0 60 A0 00 B1 02 25 35
C6F0:08 F0 03 4C B1 C8 A5 0B EA
C6F8:F0 0B B1 02 05 0A 91 02 8D
C700:C8 C0 04 D0 F5 A5 13 D0 EE
C708:25 A5 26 85 24 A5 02 85 F1
C710:04 A5 03 85 05 A5 0C 85 20
C718:17 A5 0D 85 19 A5 0F 85 99
C720:1B A5 10 85 1D A5 08 85 16
C728:14 A5 0A 85 1F 60 A5 26 B0
C730:85 25 A5 02 85 06 A5 03 33
C738:85 07 A5 0C 85 18 A5 0D A6
C740:85 1A A5 0F 85 1C A5 10 B6
C748:85 1E A5 08 85 15 A5 0A 2D
C750:85 20 60 A4 13 C6 0C D0 9D
C758:22 A5 0D 18 69 01 C9 17 7F
C760:B0 2A 85 0D A5 02 18 69 23
C768:3C 85 02 A5 03 69 01 85 57
C770:03 B9 09 D0 18 69 04 99 26
C778:09 D0 60 E6 0C E6 0C A5 F4
C780:02 18 69 04 85 02 90 E9 C3
C788:E6 03 D0 E5 A9 00 85 0D 2A
C790:A5 02 38 E9 84 85 02 A5 FC
C798:03 E9 1B 85 03 A9 3C 99 B0
C7A0:09 D0 60 A4 13 A2 04 C6 31
C7A8:0F F0 05 E8 E6 0F E6 0F 7B
C7B0:86 FB 18 26 08 CA D0 FB F0
C7B8:A6 FB 18 26 0A CA D0 FB 19
C7C0:A5 FB 29 01 F0 14 A5 10 8A
C7C8:38 E9 01 90 30 85 10 A5 75
C7D0:02 38 E9 08 85 02 B0 02 C4
C7D8:C6 03 B9 08 D0 38 E9 04 83
C7E0:99 08 D0 B0 17 98 F0 03 64
C7E8:88 D0 02 C8 C8 98 0A 0A 84
C7F0:0A 0A 85 FB AD 10 D0 25 EC
C7F8:FB 8D 10 D0 60 A9 27 85 76
C800:10 A5 02 18 69 38 85 02 FD
C808:A5 03 69 01 85 03 A9 4A 40
C810:99 08 D0 98 D0 02 C8 98 CC
C818:0A 0A 0A 0A 85 FB AD 10 9A
C820:D0 05 FB 8D 10 D0 60 A4 DC
C828:13 A2 04 C6 0F E6 0F F0 FB
C830:05 E8 C6 0F F0 02 E6 0F B4
C838:86 FB 18 66 08 CA D0 FB 7E
C840:A6 FB 18 66 0A CA D0 FB A6
C848:A5 FB 29 01 F0 16 A5 10 1C
C850:18 69 01 C9 28 B0 2C 85 E6
C858:10 A5 02 18 69 08 85 02 95
C860:90 02 E6 03 B9 08 D0 18 6F
C868:69 04 99 08 D0 90 13 98 EA
C870:D0 02 C8 98 0A 0A 0A 0A 24
C878:85 FB AD 10 D0 05 FB 8D A2
C880:10 D0 60 A9 00 85 10 A5 D0
C888:02 38 E9 38 85 02 A5 03 6C
C890:E9 01 85 03 A9 0E 99 08 F8
C898:D0 98 F0 03 88 D0 02 C8 5B
C8A0:C8 98 0A 0A 0A 0A 85 FB 1E
C8A8:AD 10 D0 25 FB 8D 10 D0 88
C8B0:60 A9 00 A8 99 00 D4 C8 A6
C8B8:C0 17 D0 F8 A9 16 8D 00 DA
C8C0:D4 A9 07 8D 01 D4 A9 4E DD
C8C8:8D 02 D4 A9 0F 8D 03 D4 60
C8D0:A9 FD 8D 06 D4 A9 01 8D A5
C8D8:0F D4 A9 43 8D 04 D4 A5 5C
C8E0:13 49 02 85 FD A8 C8 C8 D3
C8E8:B9 F7 63 18 69 01 C9 9A C0
C8F0:90 0C A9 90 99 F7 63 88 08
C8F8:C4 FD D0 EC F0 03 99 F7 14
C900:63 A9 40 85 FB A4 13 C8 71
C908:88 F0 01 88 A9 00 99 2B 70
C910:D0 A9 40 85 FC A2 00 CA 14
C918:D0 FD C6 FC D0 F9 C6 FB 34
C920:F0 16 A5 FB C9 3E B0 05 D3
C928:A9 42 8D 04 D4 B9 2B D0 C7
C930:49 01 99 2B D0 4C 11 C9 32
C938:68 68 A4 FD B9 F8 63 C9 D0
C940:91 B0 03 4C B7 C4 68 68 F7
C948:A9 00 85 28 85 FB A8 AA FB
C950:20 DB FF A4 FB E6 FB B9 62
C958:80 C3 D0 06 A9 00 85 FB EB
C960:F0 F1 8D 21 D0 A5 28 D0 EA
C968:10 A0 00 B9 00 DC 29 10 9D
C970:F0 1A C8 C0 02 D0 F4 85 EA
C978:28 A0 00 B9 00 DC 29 10 B9
C980:F0 07 C8 C0 02 90 F4 B0 60
C988:03 4C 6E C5 20 DE FF E0 38
C990:07 90 D2 A9 00 F0 B7 FF F3
```

128 Graph Designer

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```
10 REM COPYRIGHT 1987 COMPUTE
   {SPACE}PUBLICATIONS, INC. A
   LL RIGHTS RESERVED
20 TRAP 80:GRAPHIC0,1:COLOR0,6
   :COLOR4,14:COLOR5,2:SPRITE
   {SPACE}1,0
30 PRINT"{3 SPACES}COPYRIGHT 1
   987 COMPUTE! PUB., INC.":PR
   INTTAB(9)"ALL RIGHTS RESERV
   ED"
40 PRINTTAB(10)"{6 DOWN}1) GRA
   PH DESIGNER":PRINTTAB(10)"
   {DOWN}2) GRAPH SHOW"
50 PRINTTAB(10)"{DOWN}TYPE (1)
    OR (2)"
60 GETKEY A$:IF A$="1" THEN 90
70 IF A$="2" THEN 1300 ELSE 60
80 GRAPHIC 0,1:PRINT"{WHT}ERRO
   R #";ERR:PRINT ERR$(ERR):PR
   INT:HELP:END
90 DIM X$(30),P(30),R(10),CR(1
   6)
100 COLOR4,5:COLOR0,16:PRINT"
   {CLR}{WHT}{4 SPACES}PLEASE
   {SPACE}WAIT ABOUT 50 SECOND
   S...":SLEEP 2
110 REM INITIALIZE
120 FAST:GRAPHIC2,1,4:FORI=33T
   093:X=I-33-ABS(40*(I>72)):Y
   =ABS(I>72):CHAR1,X,Y,CHR$(I
   )
130 FORH=0TO7:FORV=0TO7:LOCATE
   H+X*8,V+Y*8:IFRDOT(2)=1THEN
   DRAW1,V+X*8,16-H+Y*8+8
140 NEXT:NEXT:NEXT
150 COLOR 0,11:COLOR 4,14
160 DIMH$(93),V$(93):X=0:Y=0:F
   ORI=33TO93:SSHAPEH$(I),X,Y,
   X+7,Y+7:SSHAPEV$(I),X,Y+17,
   X+7,Y+23:X=X+8:IFX=320THENX
   =0:Y=Y+8
170 NEXT
180 COLOR0,1:COLOR4,1:GRAPHIC1
   ,1:COLOR1,2:WINDOW0,4,39,24
   ,1:SLOW
190 REM MAIN MENU
200 SPRITE 1,0:CHAR1,13,2,"GRA
   PH DESIGNER":COLOR1,14:DRAW
```

```
   ,0,23 TO 319,23:COLOR1,15:D
   RAW,0,25 TO 319,25
210 IF SKP=5 THEN 230
220 FOR I=0 TO 63:READS:POKE35
   84+I,S:NEXT
230 COLOR 1,2:CIRCLE 1,275,65,
   25,20,1
240 DRAW,260,50 TO 290,80
250 DRAW,299,65 TO 275,65
260 BOX 1,155,125,175,185
270 BOX 1,175,140,195,185
280 BOX 1,44,45,104,105
290 DRAW,44,60 TO 104,60
300 DRAW,44,75 TO 104,75
310 DRAW,44,90 TO 104,90
320 DRAW,59,45 TO 59,105
330 DRAW,74,45 TO 74,105
340 DRAW,89,45 TO 89,105
350 DRAW,44,90 TO 59,60
360 DRAW,59,60 TO 74,90
370 DRAW,74,90 TO 89,75
380 DRAW,89,75 TO 104,105
390 S$="PIE":X=264:Y=40:GOSUB
   {SPACE}590
400 S$="BAR":X=165:Y=120:GOSUB
    590
410 S$="LINE":X=60:Y=40:GOSUB
   {SPACE}590
420 SPRITE 1,1,4,0,0,0,0:MOVSP
   R1,260,67:A=0:B=0
430 GET A$:IF A$=" "THEN GOSUB
    630
440 IF A$="Q"THEN SPRITE 1,0:G
   RAPHIC 0,1:END
450 IF A=0 THEN MOVSPR 1,260,6
   7
460 IF A=1 THEN MOVSPR 1,160,1
   47
470 IF A=2 THEN MOVSPR 1,56,67
480 IF A$=CHR$(13)THEN B=1
490 IF A=0 AND B=1 THEN 670
500 IF A=1 AND B=1 THEN 1040
510 IF A=2 AND B=1 THEN 1520
520 GOTO 430
530 REM SPRITE DATA
540 DATA 0,0,0,0,0,0,0,0,0,0,0
   ,0,0,0,0
550 DATA 0,0,0,0,0,0,0,0,0,0,0
   ,0,0,0,0
560 DATA 0,0,0,0,0,0,0,0,0,0,0
   ,0,0,0,0
570 DATA 0,0,0,0,0,28,0,0,14,0
   ,0,15,0,0
580 DATA 14,0,0,28,0,0,0,0,0,0
   ,0,0,0
590 FORH=1TOLEN(S$):IFASC(MID$
   (S$,H,1))=32THEN600:ELSEGSH
   APEH$(ASC(MID$(S$,H,1))),X,
   Y-8
600 X=X+8:NEXT:RETURN
610 FOR V=1 TO LEN(S$):IF ASC(
   MID$(S$,V,1))=32 THEN 620:E
   LSE GSHAPE V$(ASC(MID$(S$,V
   ,1))),X-8,Y-8
620 Y=Y-8:NEXT:RETURN
630 SOUND 1,7500,10
640 A=A+1:IF A>2 THEN A=0
650 RETURN
660 REM PIE GRAPH
670 NN=0:GRAPHIC 0,1:COLOR 5,2
   :F=0:SPRITE 1,0:GOSUB1730
680 INPUT"{CLR}HOW MANY ITEMS
   {SPACE}(2-10)";A:IF A<2 OR
   {SPACE}A>10 THEN 680
690 INPUT"{CLR}COLOR OF CHART
   {SPACE}(1-16)";B:IF B<1 OR
   {SPACE}B>16 THEN 690
700 PRINT"{CLR}MAIN TITLE (UP
   {SPACE}TO 39 LETTERS)":INPU
   T A$:IF LEN(A$)>39 THEN 700
710 PRINT"{CLR}":FOR Z=1 TO A
720 GOSUB1750:PRINT"ITEM #"Z"'
   S NAME?"
730 INPUT X$(Z):NEXT:PRINT
740 FOR Z=1 TO A
750 GOSUB1750:PRINT"ITEM #"Z"'
   S VALUE?"
760 INPUT P(Z):NEXT
770 GRAPHIC1,1:WIDTH 2:S$=A$:Y
   =15:COLOR 1,2
780 GOSUB1260:COLOR 1,B:N=0
790 FOR T=1 TO A:N=N+P(T):NEXT
800 FOR Z=1 TO A:R(Z)=(P(Z)/N*
   360):NEXT
810 DRAW,160,30 TO 160,100:FOR
    Z=1 TO A
820 O=0:FORYY=1TOZ:O=O+R(YY):N
   EXT
830 CIRCLE 1,160,100,90,70,0,O
840 DRAW,+0,+0 TO 160,100:COLO
   R 1,2:GOSUB1270:S$=X$(Z):Y=
   185:GOSUB 1260:COLOR 1,B
850 U=20:I=140:MOVSPR 1,U,I:SP
   RITE 1,1,8,0,0,0,0:COLOR 1,
   2
860 GETKEY V$
870 IF V$=CHR$(29) THEN U=U+5:
   GOTO930
880 IF V$=CHR$(157) THEN U=U-5
   :GOTO930
890 IF V$=CHR$(17) THEN I=I+5:
   GOTO930
900 IF V$=CHR$(145) THEN I=I-5
   :GOTO930
910 IF V$=CHR$(80) AND NN=0 TH
   EN 940
920 IF V$="S"OR V$="←" THEN 10
   10
930 MOVSPR 1,U,I:GOTO 860
940 E=RSPPOS(1,0)
950 L=RSPPOS(1,1)-27
960 REM SAVE
970 IF V$="S" THEN BSAVE (C$),
   B0,P7168 TO P16383:SKP=5
980 IF V$="S"THEN 180
990 IF V$=CHR$(80) THEN S$="--
   ------------------":Y=185:
   GOSUB 1260:X=E:Y=L:S$=X$(Z)
   :GOSUB 590:COLOR 1,B:NEXT:N
   N=1
1000 GOTO 860
1010 COLOR 1,1:S$="----------
   ----------":Y=185:GOSUB 12
   60:IF V$="←"THEN SKP=5:GOTO
    180
1020 SPRITE1,0:SOUND 1,3400,20
   :GOTO970
1030 REM BAR GRAPH
1040 GRAPHIC 0,1:SPRITE 1,0
1050 PRINT"{CLR}{WHT}MAIN TITL
   E (UP TO 39 LETTERS)?"
1060 INPUT A$:IF LEN(A$)>39 TH
   EN 1060
1070 PRINT"{CLR}HOW MANY ITEMS
    (1-15)":INPUT A:IF A<1 OR
   {SPACE}A>15 THEN 1070
1080 GOSUB1730
1090 PRINT"{CLR}":FOR Z=1 TO A
   :GOSUB1750:PRINT"ITEM #"Z"'
   S NAME (UP TO 5 LETTERS)?"
1100 INPUT X$(Z):IF LEN(X$(Z))
   >5 THEN 1100
1110 NEXT:PRINT
1120 FOR Z=1 TO A:GOSUB1750:PR
   INT"ITEM #"Z"'S COLOR (1-16
   )?"
1130 INPUT CR(Z):IF CR(Z)<1 OR
    CR(Z)>16 THEN 1130
1140 NEXT:PRINT
1150 FOR Z=1 TO A:GOSUB1750:PR
   INT"ITEM #"Z"'S VALUE (1-10
   0)?"
1160 INPUT P(Z):IF P(Z)<1 OR P
   (Z)>100 THEN 1160
1170 NEXT
1180 GRAPHIC1,1:S$=A$:Y=30:COL
   OR1,2:GOSUB1260
1190 FOR Z=1 TO A:Y=P(Z):COLOR
    1,CR(Z):BOX 1,(Z*20)-10,(1
   50-Y),(Z*20),150,0,1:NEXT:X
   =0
1200 COLOR 1,2:FOR Z=1 TO A:S$
   =X$(Z):X=Z*20-2:Y=199:GOSUB
    610:NEXT
1210 GETKEY V$
1220 IF V$="S" OR V$="←" THEN
   {SPACE}1240
1230 GOTO 1210
1240 IF V$="←"THEN SKP=5:GOTO
   {SPACE}180
1250 GOTO 970
1260 X=159-LEN(S$)*4:GOTO590
1270 F=F+1:IF F=1 THEN S$="---
   ----------------":Y=185:G
   OSUB 1260
1280 RETURN
1290 REM GRAPH SHOW
1300 PRINT"{CLR}{5 DOWN}"TAB(1
   0)"1) SET GRAPHS":PRINTTAB(
   10)"2) DISK CATALOG":PRINTT
   AB(10)"3) SET TIME DELAY"
1310 PRINTTAB(10)"4) BEGIN SHO
   W":PRINTTAB(10)"{DOWN}ENTER
    (1-4)"
1320 GET KEY A$:IF A$="1" THEN
    1370
1330 IF A$="2"THEN 1410
1340 IF A$="3"THEN 1440
1350 IF A$="4"THEN 1460
1360 GOTO 1320
1370 CLR:PRINT"{CLR}NUMBER OF
   {SPACE}GRAPHS TO DISPLAY":I
   NPUT N
1380 DIM FL$(N)
1390 FOR A=1 TO N:PRINT"{DOWN}
   FILENAME OF GRAPH #"A:INPUT
    FL$(A):NEXT
1400 GOTO 1300
1410 PRINT"{CLR}":DIRECTORY
1420 PRINT"{DOWN}HIT ANY KEY F
   OR MAIN MENU"
1430 GETKEY A$:GOTO 1300
1440 PRINT"{CLR}ENTER DELAY BE
   TWEEN SHOWINGS":PRINT"(IN S
   ECONDS)":INPUT D
1450 GOTO 1300
1460 IF FL$(1)=""THEN 1300
1470 PRINT"{CLR}{RVS}INSERT DA
   TA DISK - PRESS ANY KEY":PR
   INT"HOLD DOWN THE SPACE BAR
    TO FREEZE"
1480 GETKEY A$:COLOR4,1:GRAPHI
   C1,1
1490 FOR A=1 TO N:F$=FL$(A):BL
   OAD (F$):GET A$:IF A$=" "TH
   EN SOUND 1,10000,30:GETKEY
   {SPACE}A$:SOUND 1,1500,30
1500 SLEEP D:NEXT:GOTO 1490
1510 REM{2 SPACES}LINE GRAPH
1520 GRAPHIC 0,1:SPRITE 1,0:PR
   INT"{CLR}MAIN TITLE (UP TO
   {SPACE}39 LETTERS)?"
1530 INPUT A$:IF LEN(A$)>39 TH
   EN 1530
1540 GOSUB1730
1550 INPUT"{CLR}COLOR OF GRAPH
    (1-16)";C:IF C<1 OR C>16 T
   HEN 1550
1560 INPUT"{CLR}HOW MANY ITEMS
    (1-15)";A:IF A<1 OR A>15 T
   HEN 1560
1570 FOR Z=1 TO A:GOSUB1750:PR
   INT"ITEM #"Z"'S NAME (UP TO
    7 LETTERS)?"
1580 INPUT X$(Z):IF LEN(X$(Z))
   >7 THEN 1580
1590 NEXT
1600 FOR Z=2 TO A+1:GOSUB1750:
```

```
   PRINT"ITEM #"Z-1"'S VALUE (
   Ø-100)?"
1610 INPUT N:IF N<Ø OR N>100 T
   HEN 1610
1620 P(Z)=100-N:NEXT:P(1)=100
1630 GRAPHIC1,1:S$=A$:COLOR 1,
   2:Y=15:GOSUB 1260:COLOR 1,C
1640 FOR Z=25 TO (A*18)+25 STE
   P 18:DRAW,Z,32 TO Z,132:NEX
   T
1650 FOR Z=32 TO 132 STEP 10:D
   RAW,25,Z TO (A*18)+25,Z:NEX
   T
1660 COLOR 1,2:FORII=ØTO100STE
   P10:X=1:S$=MID$(STR$(II),2)
   :Y=137-II:GOSUB590:NEXT
1670 X=28:FOR Z=1 TO A:S$=X$(Z
   ):X=X+18+3:Y=199:GOSUB 610:
   NEXT:Y=32
1680 COLOR 1,C:WIDTH2:FOR Z=2
   {SPACE}TO A
1690 DRAW,(Z*18)+7,P(Z)+32 TO
   {SPACE}((Z+1)*18)+7,P(Z+1)+
   32:NEXT
1700 GETKEY V$:IF V$="S"THEN 9
   70
1710 IF V$="<"THEN SKP=5:GOTO
   {SPACE}180
1720 GOTO1700
1730 INPUT"{CLR}ENTER GRAPH FI
   LENAME";C$:IFLEN(C$)>16THEN
   1730
1740 RETURN
1750 PRINT"{DOWN}**************
   ********************************
   ":RETURN
```

Alt-80 For The 128

Article on page 56.

Alt-80 Demo

```
RD 10 REM 1987 COMPUTE PUBLICA
      TIONS, INC. - ALL RIGHTS
       RESERVED
MC 20 WREG=DEC("CDCC"):TEXT=26
      06:ATTR=2607:U$=CHR$(2)
SH 30 BANK 15:BA=0:GOSUB 150:C
      OLOR 5,4:REM DEFAULT SCR
      EEN
XK 40 PRINT"{CLR}"TAB(13)"1987
       COMPUTE! PUBLICATIONS,
      {SPACE}INC. - ALL RIGHTS
       RESERVED"
BQ 50 PRINTU$TAB(32)"DEFAULT S
      CREEN":LIST
HS 60 PRINT SPC(180)"PRESS A K
      EY FOR ALTERNATE SCREEN"
      :GETKEY A$
FM 70 BASE=16:GOSUB 150:REM NE
      W SCREEN RAM AND ATTRIBU
      TE MEMORY
FM 80 COLOR 5,2:PRINT"{CLR}":C
      ATALOG:CHAR,36,10:PRINT
      {SPACE}U$ "ALTERNATE SCR
      EEN"
MA 90 CHAR,30,14:PRINT CHR$(15
      )"PRESS A KEY FOR ORIGIN
      AL SCREEN"
KQ 100 CHAR,34,16,"OR PRESS <S
       TOP> TO END",1
CG 110 REM LOOP TO TOGGLE BETW
       EEN SCREENS
XA 120 TRAP 180:DO:GETKEY A$
SF 130 BASE=XOR(BASE,16):GOSUB
        150:LOOP
PC 140 REM ROUTINE TO SET VDC
       {SPACE}ADDRESSES & SCRE
       EN EDITOR BASE
AG 150 SYS WREG,BASE,12:POKE T
       EXT,BASE
JP 160 SYS WREG,BASE+8,20:POKE
        ATTR,BASE+8
RB 170 RETURN
JP 180 BASE=0:GOSUB 150:COLOR
       {SPACE}5,4:CHAR,0,0
```

Hi-Res Graphics On The 128

Article on page 70.

Hi-Res Graphics—Demo 1

```
JC 100 FAST
PA 110 GRAPHIC3,1:REM MULTICOL
       OR HI-RES
MB 120 COLOR0,1:COLOR4,1:COLOR
       1,3:COLOR2,7
HG 130 FORT=1TO8
FE 140 BOX2,1,1,10,20:REM DRAW
        OUTLINE
HG 150 CIRCLE1,5,15-T,3,5:REM
       {SPACE}DRAW BALL
BG 160 PAINT2,5,15-T,1:REM FIL
       L BALL
JE 170 SSHAPEA$(T),1,1,10,20:R
       EM SAVE IN A$
ES 180 GRAPHIC3,1:REM CLEAR SC
       REEN
HD 190 NEXTT:REM LOOP
FS 200 SLOW
FR 210 GRAPHIC3,1:REM CLEAR SC
       REEN
SR 220 FORT=1TO8
RB 230 GSHAPEA$(T),100,100,0:R
       EM GET SHAPE AND DRAW I
       T
SA 240 NEXT
RA 250 FORT=8TO1STEP-1
DA 260 GSHAPEA$(T),100,100,0:R
       EM GET AND DRAW SHAPE
CC 270 NEXT
ME 280 GOTO220
```

Hi-Res Graphics—Demo 2

```
PX 100 GRAPHIC3,1:COLOR0,12:CO
       LOR4,12:COLOR1,3:COLOR2
       ,1
HF 110 FORY=1TO160STEP20:REM Y
        COORDINATES LOOP
CB 120 FORX=1TO96STEP12:REM X
       {SPACE}COORDINATES LOOP
DS 130 IFC=1THENC=2:ELSE:C=1
FC 140 BOXC,X,Y,X+10,Y+20,,1:R
       EM DRAW BOX AND FILL WI
       TH PROPER COLOR
RG 150 NEXTX:IFC=1THENC=0:ELSE
       C=1
KJ 160 NEXTY
```

Hi-Res Graphics—Demo 3

```
AQ 100 GRAPHIC1,1:COLOR0,1:COL
       OR4,1:COLOR1,2
DK 110 FORT=1TO90STEP3:REM SET
        UP LOOP FOR BOX ROTATI
       ON
MJ 120 BOX1,110,50,210,150,T:R
       EM DRAW & ROTATE
RD 130 NEXTT
QE 140 SLEEP2
MC 150 GRAPHIC1,1:REM CLEAR SC
       REEN
EX 160 FORT=1TO150STEP3:REM SE
       T UP LOOP FOR ROTATION
       {SPACE}OF BOX
EA 170 X=X+1:Y=Y+1:REM INCREME
       NT X AND Y POINTERS
KE 180 BOX1,X,Y,X2+10,Y2+10,T:
       REM DRAW BOX
FC 190 X2=X2+X-2:Y2=Y2+X-2:NEX
       TT:REM INCREMENT X2 AND
        Y2 POINTERS
EM 200 SLEEP2:GRAPHIC1,1:REM C
       LEAR SCREEN
RQ 210 Y=1:FORX=320TO1STEP-10:
       REM LOOP FOR X POINTER
RM 220 DRAW1,X,1TO1,Y:REM DRAW
        LINE
FB 230 Y=Y+10
QQ 240 NEXTX
RP 250 SLEEP2
MR 260 FORX=1TO320STEP10:REM L
       OOP FOR X POINTER
SB 270 DRAW1,318,YTOX,199:REM
       {SPACE}DRAW LINE
DG 280 Y=Y-10
XA 290 NEXTX
GR 300 SLEEP2
JQ 310 GRAPHIC1,1
KH 320 Y=1:FORX=160TO1STEP-10:
       REM LOOP FOR X POINTER
ES 330 DRAW1,X,1TO1,Y:REM INCR
       EMENT Y
XS 340 Y=Y+6.25
ED 350 NEXTX
QA 360 FORX=1TO160STEP10
SA 370 DRAW1,1,YTOX,199
AA 380 Y=Y+6.25
EG 390 NEXTX
DF 400 FORX=160TO320STEP10
HM 410 DRAW1,X,199TO318,Y
PC 420 Y=Y-6.25
KJ 430 NEXTX
PB 440 FORX=320TO160STEP-10
HS 450 DRAW1,318,YTOX,1
XG 460 Y=Y-6.25:IFY<1THENEND
KP 470 NEXTX
```

Calendar Maker

Article on page 57.

```
RC 2 REM COPYRIGHT 1987 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED
JD 4 REM DRIVE#{2 SPACES}PRINT
     ER#{2 SPACES}REVERSE ON
     {2 SPACES}REVERSE OFF
     {2 SPACES}SPACER
PK 6 DR=8:PR=4:RV$=CHR$(18):RO
     $=CHR$(146):SP$="*"
AP 8 S1$=" ":FORI=1TO21:SX$=SX
     $+S1$:NEXT:S6$=LEFT$(SX$,
     6):NA$=CHR$(0)
BD 10 PRINTCHR$(142)CHR$(8):DI
     MM(12),Y$(4),Q$(6),H$(25
     ),C$(6),M$(4)
FQ 12 FORI=1TO12:READM(I):NEXT
     :READD$:D$=D$+" "+D$+" "
     +D$
BC 14 FORI=1TO4:READA$,B$,C$:M
     $(I)=S6$+A$+LEFT$(SX$,15
     )+B$+LEFT$(SX$,15)+C$:NE
     XT
BG 16 FORI=1TO31:Q$=Q$+RIGHT$(
     STR$(I),2)+" ":NEXT:READ
     F$
BF 18 FM$=CHR$(17)
DM 20 REM --- PARSE YEAR ---
RX 22 PRINTCHR$(147)"
     {3 SPACES}COPYRIGHT 1987
      COMPUTE! PUB., INC."
SD 24 PRINTTAB(10)"ALL RIGHTS
     {SPACE}RESERVED"
EF 26 PRINTFM$TAB(13)"CALENDAR
      MAKER":PRINTTAB(13)"---
     ----------"FM$
```

```
SS 28 INPUT"WHAT YEAR WOULD YO
      U LIKE";Y$:IFLEN(Y$)=2TH
      ENY$="19"+Y$
BM 30 Y=VAL(Y$):IFY<1900ORY>20
      50GOTO26
HH 32 FORJ=1TO4:FORI=.TO4:Y$(J
      )=Y$(J)+MID$(F$,I*10+VAL
      (MID$(Y$,J,1))+1,1)
KX 34 NEXT:NEXT
MR 36 REM --- GET TEXT ---
PQ 38 PRINTFM$"ENTER TEXT (254
       CHAR. MAX).":PRINTFM$">
      > ";
ED 40 GETA$:IFA$=""THEN40
MC 42 IFA$=CHR$(13)GOTO52
GR 44 IFA$=CHR$(20)ANDN$>""THE
      NN$=LEFT$(N$,LEN(N$)-1):
      GOTO48
SA 46 ON-(A$<" "OR(A$>CHR$(127
      )ANDA$<CHR$(160))ORLEN(N
      $)=254)GOTO40:N$=N$+A$
GK 48 PRINTA$;:GOTO40
QK 50 REM --- REVERSE ---
CH 52 PRINT:PRINTFM$"REVERSE Y
      EAR HEADING? (Y/N) ":GOS
      UB120
AE 54 ON-(A$="Y")-(A$="N")*2GO
      TO60,56:GOTO52
QG 56 RV$=NA$:RO$=NA$:S1$=SP$
JA 58 REM --- WHERE ---
CM 60 PRINTFM$"(S)CREEN, (P)RI
      NTER, OR (D)ISK?":GOSUB1
      20
RP 62 ON-(A$="S")-(A$="P")*2-(
      A$="D")*3GOTO76,64,70:GO
      TO52
PE 64 PRINTFM$"SET UP PRINTER
      {SPACE}AND HIT ANY KEY..
      ."
HR 66 GETB$:IFB$=""THEN66
DM 68 GOTO76
AA 70 OPEN15,DR,15,"I0:":OPEN3
      ,DR,3,"0:"+Y$+" CALENDAR
      ,S,W"
QK 72 INPUT#15,B$,C$:IFB$<"19"
      GOTO80
KK 74 CLOSE3:CLOSE15:PRINTFM$"
      DISK ERROR -- "B$" "C$:F
      ORI=1TO2000:NEXT:GOTO60
AG 76 OPEN3,3-((A$="P")+(PR=5)
      )
AM 78 REM --- PRINT HEADING --
      -
DD 80 PRINTFM$"WORKING...":FOR
      I=1TOINT(255/(LEN(N$)+1)
      ):AA$=AA$+N$+S1$:NEXT
JE 82 FORI=1TO17STEP4:P=.:FORK
      =1TO4:B=VAL(MID$(Y$(K),I
      /4+1,1)):FORL=2TO.STEP-1
MB 84 IF(BAND2↑L)=.THENFORJ=IT
      OI+3:H$(J)=H$(J)+NA$+"
      {5 SPACES}"+NA$:NEXT:GOT
      O88
SF 86 FORJ=ITOI+3:H$(J)=H$(J)+
      RV$+MID$(AA$,J+P*5,5)+RO
      $:NEXT
DA 88 P=P+1:NEXT:NEXT:NEXT:A$=
      "{2 SPACES}":L=21:FORI=1
      TO20
EP 90 N$=LEFT$(H$(I),L)+A$+MID
      $(H$(I),22,L)+A$+MID$(H$
      (I),43,L)+A$+RIGHT$(H$(I
      ),L)
QG 92 PRINT#3,S6$+" "+N$:NEXT:
      PRINT#3:PRINT#3:PRINT#3:
      M=1
XR 94 REM --- PRINT CALENDAR -
      --
AF 96 Z=INT(365.25*(Y-1))+INT(
      30.6*(M+13))-1
MK 98 FORI=1TO10STEP3:FORJ=ITO
      I+2:D=M(M)+(Y/4=INT(Y/4)
      )*(M=2)
JF 100 IFRIGHT$(Y$,2)="00"THEN
       YC=VAL(LEFT$(Y$,2)):D=D
       -(YC/4<>INT(YC/4))*(M=2
       )
EM 102 Z=Z-INT(Z/7)*7:Q$(1)=LE
       FT$(LEFT$(SX$,3*Z)+Q$,2
       1):L=7-Z:K=1:A=.
FR 104 K=K+1:B=A:A=(L+7+D-ABS(
       L+7-D))/2:Z=A-B
KH 106 Q$(K)=LEFT$(MID$(Q$,3*L
       +1,3*Z)+SX$,21)
DP 108 L=L+7:ON-(A<D)GOTO104:I
       FK=5THENQ$(6)=SX$
XK 110 FORK=1TO6:C$(K)=C$(K)+"
       {2 SPACES}"+Q$(K):Q$(K)
       =SX$:NEXT:M=M+1:NEXT
RS 112 PRINT#3,S6$+M$(J/3):PRI
       NT#3:PRINT#3,S6$+D$:FOR
       K=1TO6
DS 114 PRINT#3,"{5 SPACES}"+C$
       (K):C$(K)="":NEXT:PRINT
       #3:NEXT:FORI=1TO3:PRINT
       #3:NEXT
RJ 116 CLOSE3:CLOSE15:PRINTFM$
       "DONE...HIT ANY KEY TO
       {SPACE}CONTINUE":GOSUB1
       20:PRINT
JE 118 PRINTFM$"MAKE ANOTHER?
       {SPACE}(Y/N)":GOSUB120:
       ON-(A$<>"Y")GOTO126:RUN
JK 120 GETA$:IFA$=""THEN120
CR 122 RETURN
DX 124 REM --- DATA ---
EM 126 DATA31,28,31,30,31,30,3
       1,31,30,31,30,31
PR 128 DATA" SU MO TU WE TH FR
        SA "
HG 130 DATA" JANUARY","FEBRUAR
       Y","{2 SPACES}MARCH","
       {2 SPACES}APRIL ","
       {2 SPACES}MAY{3 SPACES}
       ","{3 SPACES}JUNE"
RS 132 DATA"{2 SPACES}JULY
       {2 SPACES}","  AUGUST ",
       "SEPTEMBER","  OCTOBER",
       "NOVEMBER","DECEMBER"
RG 134 DATA"727757777756115441
       555273777177524111515 17
       777177177"
```

GEOS Notepad Printer

Article on page 66.

```
HE 10 POKE53280,2:POKE53281,15
      :POKE646,11:PRINT"{CLR}"
      :GOSUB480
CH 20 PRINTSPC(19)"NOTEPAD"
FB 30 PRINTSPC(19)"PRINTER"
CD 40 DIMVLIR(1,127)
XR 50 FS$="NOTES":FORCT=0TO15:
      PD$=PD$+CHR$(160):NEXTCT
      :FS$=LEFT$(FS$+PD$,16)
AH 60 OPEN15,8,15,"I0"
AJ 70 INPUT#15,ER$,EM$:IFER$<>
      "00"THENPRINTER$+" "+EM$
      :CLOSE15:END
KG 80 T=18:S=1:PRINT"{DOWN}SEA
      RCHING FOR NOTES"
FJ 90 OPEN2,8,2,"#"
PP 100 PRINT#15,"U1";2;0;T;S:F
       C=0:FP=2:BP=5
JD 110 PRINT#15,"B-P";2;0:GET#
       2,NT$,NS$:T=ASC(NT$+CHR
       $(0)):S=ASC(NS$+CHR$(0)
       )
KM 120 PRINT#15,"B-P";2;FP:GET
       #2,FT$:IFASC(FS$+CHR$(0
       ))=0THEN190
SE 130 PRINT#15,"B-P";2;BP
PS 140 FORCT=0TO15:GET#2,BI$:F
       I=ASC(BI$+CHR$(0)):IFFI
       >96ANDFI<123THENFI=FIAN
       D223
PK 150 DN$=DN$+CHR$(FI)
PQ 160 NEXTCT
CX 170 IFDN$=FS$THEN220
KE 180 DN$=""
QG 190 FC=FC+1:IFFC=8ANDT<>0TH
       EN100
JH 200 IFFC=8ANDT=0THEN510
GD 210 FP=FP+32:BP=BP+32:GOTO1
       20
CA 220 PRINT"{DOWN}STANDBY-SCA
       NNING NOTEPAD"
MS 230 PRINT#15,"B-P";2;BP-2:G
       ET#2,VT$,VS$:VT=ASC(VT$
       +CHR$(0)):VS=ASC(VS$+CH
       R$(0))
MG 240 PRINT#15,"U1";2;0;VT;VS
       :PRINT#15,"B-P";2;2
KS 250 GET#2,PT$,PS$
XB 260 PT=ASC(PT$+CHR$(0)):PS=
       ASC(PS$+CHR$(0)):IFPC=0
       ANDPT=0THEN520
RK 270 IFPT=0THEN310
JJ 280 VLIR(0,PC)=PT:VLIR(1,PC
       )=PS
GA 290 PC=PC+1:IFPC=127THEN310
MG 300 GOTO250
GS 310 CLOSE2:CLOSE15
KS 320 IFPC>1THENPRINT"{DOWN}T
       HERE ARE "PC"PAGES IN T
       HIS NOTEPAD":GOTO340
SB 330 PRINT"{DOWN}THERE IS 1
       {SPACE}PAGE IN THIS NOT
       EPAD"
GA 340 PRINT"{DOWN}DO YOU WANT
        TO PRINT THE {RVS}E
       {OFF}NTIRE NOTEPAD OR A
        {RVS}S{OFF}INGLE PAGE;
       ";
QB 350 INPUT"E/S";AN$:IFAN$="E
       "THEN380
EA 360 IFAN$="S"THEN420
KP 370 GOTO340
BF 380 FORCT=0TOPC-1
DP 390 GOSUB530
DM 400 NEXTCT
HA 410 PRINTSPC(18)"{RED}DONE!
       ":END
AD 420 PRINT"{DOWN}WHICH PAGE
       {SPACE}DO YOU WANT TO P
       RINT 1 -";PC
AJ 430 INPUT"-> ";AN$:CT=VAL(A
       N$)-1:IFCT<0ORCT>PCTHEN
       PRINT"{4 UP}":GOTO420
MR 440 GOSUB530
XJ 450 PRINT"{2 UP}DO YOU WANT
        TO PRINT ANOTHER PAGE?
       {5 SPACES}"
PS 460 INPUT"Y/N{3 SPACES}
       {3 LEFT}";AN$:IFAN$="Y"
       THENPRINT"{4 UP}":GOTO4
       20
XX 470 PRINTSPC(18)"{RED}DONE!
       ":END
EA 480 FORID=1TO63:READNI:POKE
       895+ID,NI:NEXTID
AJ 490 POKE53269,3:POKE2041,14
       :POKE53288,11:POKE5325 0
       ,145:POKE53251,55
QF 500 RETURN
RA 510 PRINTSPC(4)"{RED}{DOWN}
       THERE ARE NO NOTES ON T
       HIS DISK![4]":CLOSE15:E
       ND
SS 520 PRINTSPC(3)"{RED}{DOWN}
       THERE ARE NO PAGES IN T
       HE NOTEPAD![4]":CLOSE15
       :END
```

```
XF 530 C=Ø:TC=Ø:NP$="":OPEN15,
       8,15:OPEN2,8,2,"#"
HG 540 PRINT#15,"U1";2;Ø;VLIR(
       Ø,CT);VLIR(1,CT)
DQ 550 PRINT#15,"B-P";2;2
BJ 560 GET#2,PP$:TC=TC+1
HQ 570 PL=ASC(PP$+CHR$(Ø)):IFP
       L=ØTHEN62Ø
QB 580 IFPL>96ANDPL<123THENPL=
       PLAND223
GQ 590 NP$=NP$+CHR$(PL)
QS 600 IFTC=254THEN62Ø
XQ 610 GOTO56Ø
DC 620 CLOSE2:CLOSE15
PR 630 OPEN4,4:PRINT#4,"PAGE "
       ;CT+1:PRINT#4,NP$:PRINT
       #4:CLOSE4:RETURN
MF 640 REM *-> ICON (SPRITE) D
       ATA <-*
FR 650 DATA255,255,255,128,ØØØ
       ,ØØ1,131,255
HC 660 DATA193,13Ø,Ø57,193,131
       ,255,193,13Ø
BJ 670 DATAØØØ,Ø65,13Ø,ØØØ,Ø65
       ,13Ø,ØØØ,Ø65
RM 680 DATA13Ø,ØØØ,Ø65,13Ø,ØØØ
       ,Ø65,131,ØØØ
JA 690 DATAØ65,13Ø,128,Ø65,131
       ,255,193,128
JK 7ØØ DATAØØØ,ØØ1,135,255,225
       ,137,Ø36,157
DX 710 DATA159,255,253,159,255
       ,253,143,255
MR 720 DATA241,128,ØØØ,ØØ1,255
       ,255,255,167
```

bug-swatter

Modifications and Corrections

● In "Hints & Tips: Fast Data Update" (September 1986), Ben Bowen shows how to use the 128's POINTER function to speed up loading and saving numeric arrays from and to the disk drive. In the sample program, line 510 incorrectly saves the contents of the array. As is, the last element of the array is garbage when the array is loaded back into memory. The correct line is:

```
BSAVE"DATA",B1,P(POINTER(A(0)))
  TO P(POINTER(A(50))+5)
```

for floating point arrays, or

```
BSAVE"DATA",B1,P(POINTER(A%(0)))
  TO P(POINTER(A%(50))+2)
```

for integer arrays.

● In the May "Bug-Swatter," several corrections were listed for "Pick-A-Letter" (February), but another problem was created. When a player first correctly guesses a letter in a new phrase, Pick-A-Letter awards the points to the player, but then allows the next player to guess. To fix the problem, lines 1332 and 1334 should be deleted, and the following three lines should be changed as shown:

```
KH 1310 IFA$=CD$THENZX=1:GOTO1
        340
QD 1330 GOSUB70:PRINT"{HOME}
        {4 DOWN}{RIGHT}"TAB(10
        *CP)"[8]{4 SPACES}
        {4 LEFT}"C(CP);:GOTO87
        Ø
FX 1470 GOTO 950
```

● Several readers have become confused when trying to draw with cursor keys rather than a joystick in "Color Craft" (March). The up and down cursor keys are reversed, making it difficult for those who are used to the normal cursor key arrangement. To restore the usual function of the cursor keys, type in and save the following short patch program. Then put the disk containing the original Color Craft program in the disk drive and type RUN. The patch program will load the machine language routines for Color Craft, correct the problem, and save the corrected program back to your disk. Lines 10, 30, and 50 of the patch program assume that your original copy of the machine language for Color Craft is saved under the name COLOR CRAFT.OBJ. If this is not the case, you must either change those lines in the patch program or rename the disk file to match the name used in the patch program.

```
PP 10 IF A=Ø THEN A=1:PRINT"LO
      ADING...":LOAD "COLOR CR
      AFT.OBJ",8,1
XQ 20 POKE51369,145:POKE51379,
      17:OPEN15,8,15,"S0:COLOR
       CRAFT.OBJ"
KX 30 INPUT#15,EN,EM$,ET,ES:CL
      OSE15:PRINTEN;EM$;ET;ES
QR 40 PRINT "SAVE THE CORRECTE
      D VERSION..."
GB 50 OPEN1,8,1,"Ø:COLOR CRAFT
      .OBJ,P,W"
EE 60 POKE193,Ø0:POKE194,192:P
      OKE780,193:POKE781,205:P
      OKE782,203:SYS65496
HP 70 CLOSE1
```

● There are a couple problems with the program listings for "Fast Boot" (May). In line 530 of Fast Boot ML Maker (Program 1), a character was accidently cut from the end of the line. The correct line is:

```
JB 530 DATA 2,169,55,141,122,2
       ,169,56
```

In line 5 of Fast Boot (Program 2), the lister program we used incorrectly interpreted a character. The character appears in the listing as {TOP}. This character should be entered by holding down the CTRL key and typing the letter O.

● The demo programs from "Hi-Res Graphics On The 128, Part 1" (June) do not clear the graphics screen correctly. The problem occurs because the colors are set after switching to hi-res mode. To correct the problem, line 20 of Demo 1 should be moved to line 5, and line 30 of Demo 2 should be moved to line 5. To move the lines, simply load the example program and type LIST. Now move the cursor over the line number of the line to be moved, type the new line number, and press RETURN. Then delete the old line. The demo programs on the Gazette Disk are correct.

● The "SpeedView" 80-column preview enhancment to *SpeedScript* in the November issue of COMPUTE! magazine (p. 76) should not be confused with another SpeedScript 80-column preview enhancement of the same name released earlier by Upstart Publishing (P.O. Box 22022, Greensboro, NC 27420), and advertised in this magazine. The latter program is a part of Upstart Publishing's "SpeedMate" customizer program for *SpeedScript*.

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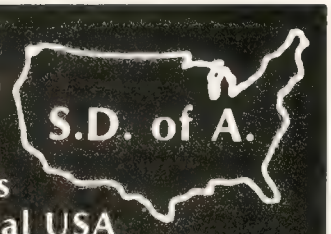

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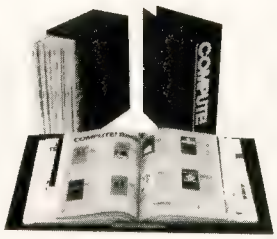

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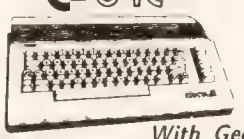

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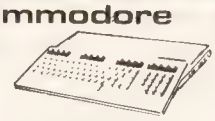

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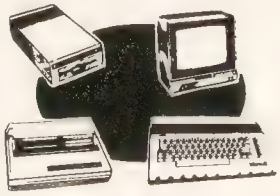

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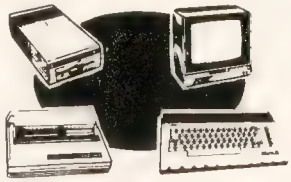

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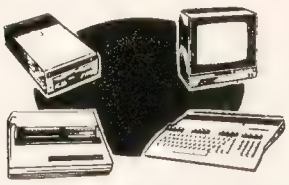

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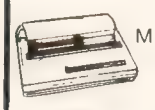

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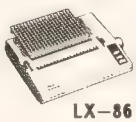

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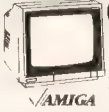

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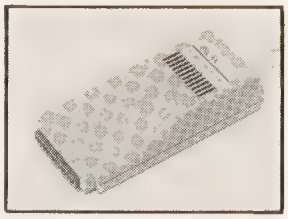

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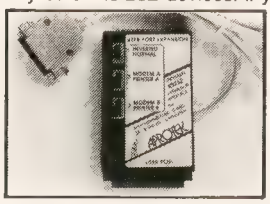

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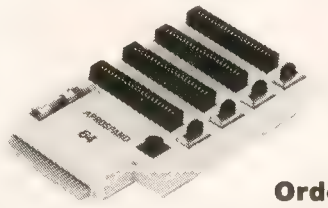

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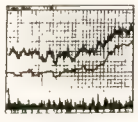

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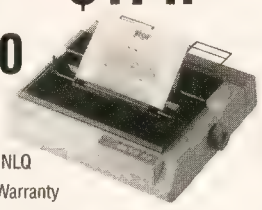

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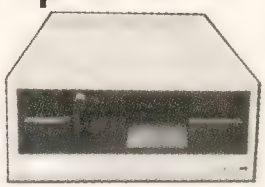

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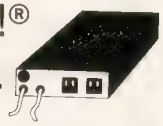

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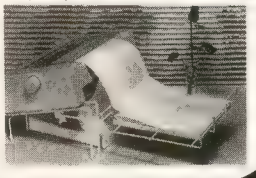

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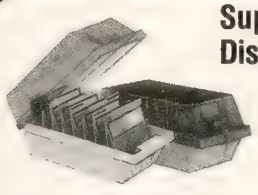

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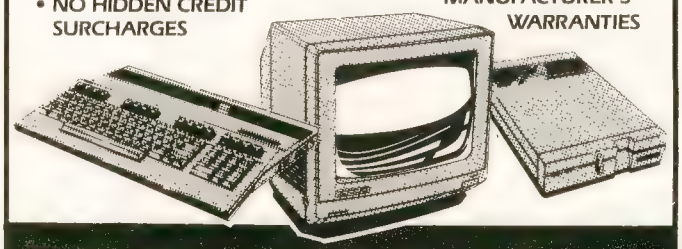

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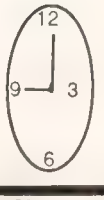

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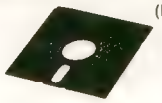

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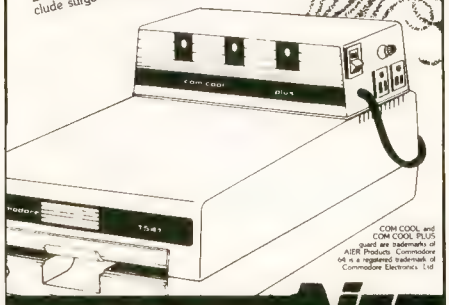

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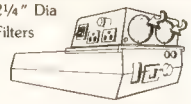

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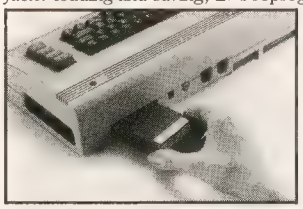

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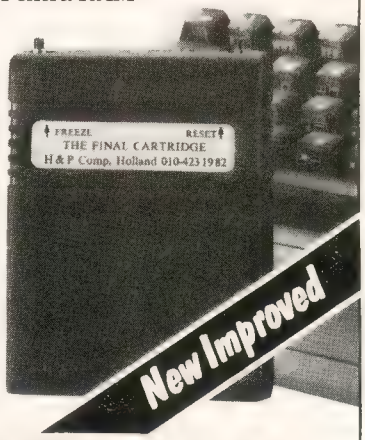

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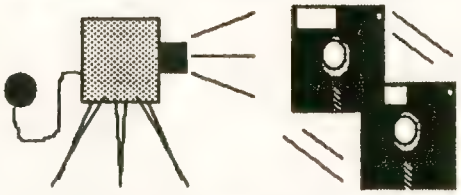

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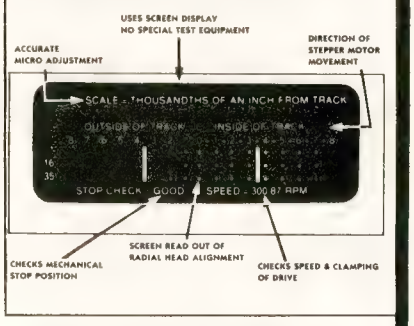
1541 Physical Exam Sample Screen


USES SCREEN DISPLAY NO SPECIAL TEST EQUIPMENT
ACCURATE MICRO ADJUSTMENT
DIRECTION OF STEPPER MOTOR MOVEMENT
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See Reviews in: Run Special Issue #3, 1/87, p.83; **Info #11**, Aug/Sept 86, p.46 **Midnite Gazette**, April 1986, p. 19.

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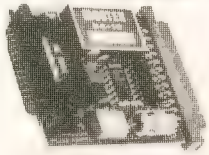
*No specs. available
**Note: 82S100PLA = U17 (C-64)



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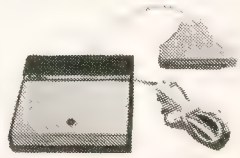

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7/87

COMPUTE!'s GAZETTE Author's Guide

Here are some suggestions which serve to improve the speed and accuracy of publication for prospective authors. COMPUTE!'s GAZETTE is primarily interested in new and timely articles on the Commodore 128, 64, Plus/4, and 16. We are much more concerned with the content of an article than with its style, but articles should be as clear and well-explained as possible.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page: If your article is specifically directed to one model of computer, please state the model name. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should be placed about ⅔ of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number—for example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not right-justify. Leave the lines ragged.

6. Standard typing or computer paper should be used (no erasable, onionskin, or other thin paper), and typing should be on one side of the paper only (upper- and lowercase).

7. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

8. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we request that you include a copy of the text file on the tape or disk. If you include a copy of your article on disk, please save the article as plain text, without any special formatting characters or control codes. Most word processors provide an option for saving a document as plain ASCII text or in unformatted form. Please use high-quality 10- or 30-minute tapes with the program recorded on both sides. The tape or disk should be labeled with your name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores). If possible, programs written in machine language or a compiled language should include source code (or an annotated disassembly if the program was written with a machine language monitor).

9. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), and so on. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: Use *and* (not &), *reference* (not ref.), *through* (not thru).

10. For greater clarity, use all capitals when referring to keys (RETURN, CTRL, SHIFT), BASIC words (LIST, RND, GOTO), and the language BASIC. Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word; then it will be italicized during typesetting.

11. Articles can be of any length—from a single-line routine to a multiple-issue series. The average article is about four to eight double-spaced, typed pages.

12. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

13. COMPUTE!'s GAZETTE pays between $70 and $800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (to Editorial Department, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403), it will take from three to six weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

14. If your article is accepted and you subsequently make improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing *Revision* on the envelope and the article.

15. COMPUTE!'s GAZETTE does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact the Features Editor for details.

How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 16, and VIC-20. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then back on, erasing whatever was in memory. So be sure to *save a copy of your program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's)

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

MLX Machine Language Entry Program For Commodore 64

Ottis Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

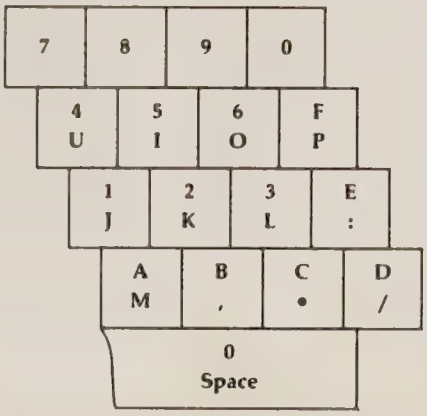
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, the numeric keypad modification from the March 1986 "Bug-Swatter" column is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redis-

played. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS{4}";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS{4}";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N]{4}";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}{4}":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}{4}ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
```

```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       [43]";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
       3*(A$=".")-4*(A$="/")-5
       *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
       ")-9*(A$="U")-10*(A$="I
       ")-11*(A$="O")-12*(A$="
       P")
CM 487 A=A-13*(A$=S$):IF A THE
       N A$=MID$("ABCD123E456F
       0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
       UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
       :J=2-J:IF J THEN PRINT
       {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
       {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$
       :IF IN$=N$ THEN CLOSE3:
       GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
       MID$(IN$,I):GOSUB320:IF
        I<25 THEN GOSUB380:A(I
       /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
       B1060:PRINT"{BLK}{RVS}
       {SPACE}ERROR: REENTER L
       INE [43]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
       LOSE3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
       {SPACE}DISPLAY DATA ":G
       OSUB400:IF IN$=N$ THEN2
       20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAU
       SE, {RVS}RETURN{OFF} TO
        BREAK[43]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
       I=BTO B+7:A=PEEK(I):GOS
       UB350:GOSUB380:PRINT S$
       ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
       :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
       ENPRINT"{DOWN}{BLU}** E
       ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
       SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
       UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
       {SPACE}DATA ":OP=1:GOTO
       710
PC 700 PRINT"{DOWN}{RVS} SAVE
       {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
       NAME[43]";IN$:IF IN$=N$
       {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}
       D{OFF}ISK: [43]";
FP 730 GET A$:IF A$="T"THEN PR
       INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
       ,15,"I0:":B=EA-SA:IN$="
       0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
       OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
       H*256):PRINT#1,CHR$(AL)
       ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
       R$(PEEK(BS+I));:IF ST T
       HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
       O940
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       [43]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
       OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
       $)+256*ASC(B$+Z$):IF AD
       <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
       OKE BS+I,ASC(A$+Z$):IF(
       I<>B)AND ST THEN F=2:AD
       =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
       >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
        CLOSE1:CLOSE15:GOSUB10
       60:PRINT"{RVS}ERROR: "A
       $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
       187,PEEK(FA+3):POKE188,
       PEEK(FA+4):IFOP=0THEN92
       0
HJ 890 SYS 63466:IF(PEEK(783)A
       ND1)THEN GOSUB1060:PRIN
       T"{DOWN}{RVS} FILE NOT
       {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
       30):IF AD<>SA THEN F=1:
       GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
       2)-1:F=F-2*(A<EA)-3*(A>
       EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
       OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
       UB1010:ON OP GOTO950:SY
       S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
        SAVE COMPLETED **":GOT
       O220
XP 950 POKE147,0:SYS 63562:IF
       {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
        LOAD COMPLETED **":GOT
       O220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}[43]":ON F GOSUB98
       0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
       G ADDRESS (";:GOSUB360:
       PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
       AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
       ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
       *256):POKE193,AL:POKE1
       94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
       *256):POKE174,AL:POKE1
       75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
       )OR(AD>49151 AND AD<53
       248)THEN GOSUB1080:F=0
       :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
       {SPACE}INVALID ADDRESS
        {DOWN}{BLK}":F=1:RETU
       RN
AR 1060 POKE SD+5,31:POKE SD+6
       ,208:POKE SD,240:POKE
       {SPACE}SD+1,4:POKE SD+
       4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
       TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
       240:POKE SD,0:POKE SD+
       1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
       KE SD+4,0:POKE SD,0:PO
       KE SD+1,0:RETURN
```

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The Automatic Proofreader

Philip I. Nelson, Assistant Editor

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, 16, and VIC-20 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, 65526 for the Plus/4 and 16, and 64802 for the VIC). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
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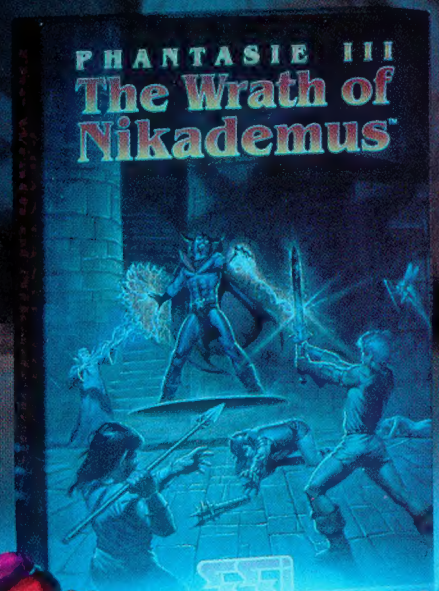

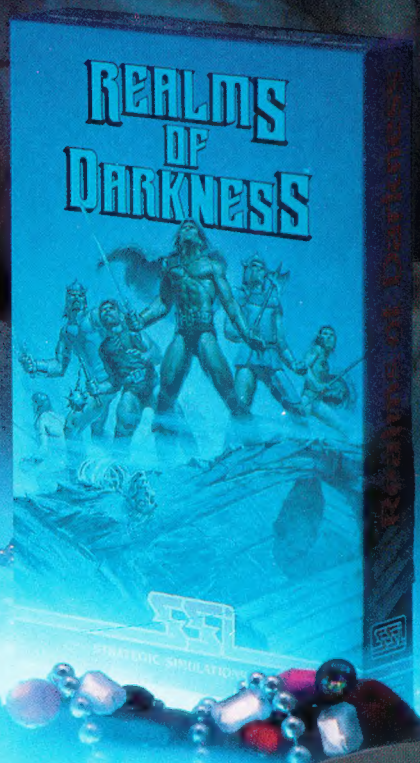

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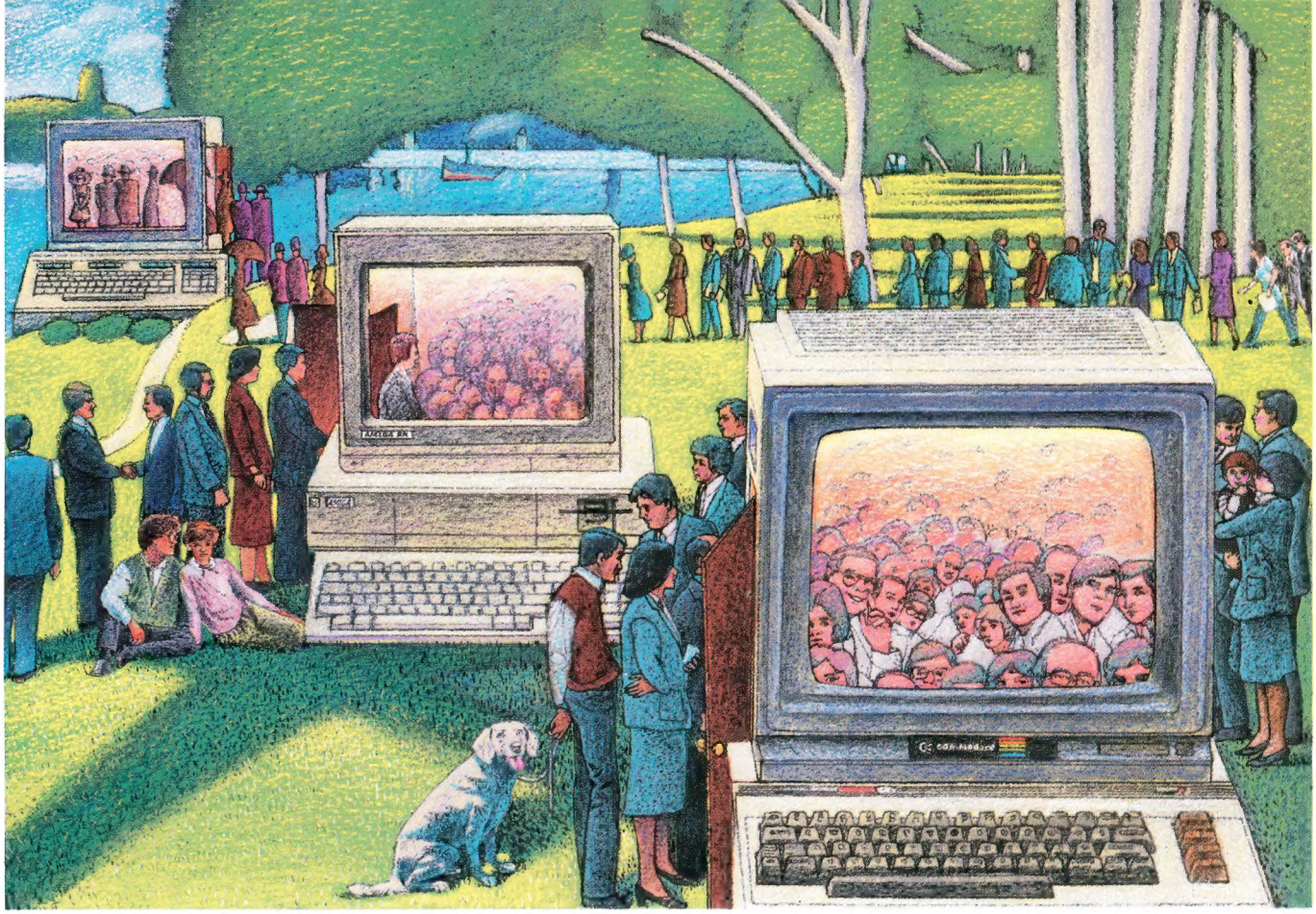

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